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ABSTRACT

This document consists of the six issues of the "Wilderness Medicine Newsletter" issued during 1995. The newsletter addresses issues related to the treatment and prevention of medical emergencies in the wilderness. Issues typically include feature articles, interviews with doctors in the field of wilderness medicine, product reviews, notices of upcoming wilderness conferences and training courses, additional resources, and general information relevant to medical services and outdoor activities. Feature articles in this volume cover legal and ethical issues for the wilderness care provider; qualifications of outdoor leaders; high altitude illness; "crush syndrome" following rescue from crevice entrapment; parasitic infestations of humans by viruses, bacteria, fungi, protozoa, and parasitic worms; hepatitis-A; first aid for children; prevention, recognition, and treatment of hypothermia; items to include in first aid kits; treating chest injuries in the wilderness; and cardiac risk assessment for adventure programs. (TD)

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

JANUARY/FEBRUARY 1995 ISSN-1059-6518 VOLUME 6, NUMBER 1

CAN I DO THAT? LEGALLY? *by Ken Thompson*

Editors' Note:

Arriving a bit later than we anticipated, we hope it was worth the wait. This edition of the newsletter includes some real controversial stuff. Anyone wishing to make comments should send them to: WILDERNESS MEDICINE NEWSLETTER, PO Box 3150, Conway, New Hampshire 03818, ATTENTION HOLLY WEBER. Enjoy the issue and we'll catch you earlier next month.

Cheers,
Holly & Ken

Shenandoah National Park, Virginia, 1992—An out-of-state WEMT traveling with a group of college students came upon a 51-year-old man who had fallen about thirty feet onto a sloping granite ledge. The EMT, who we'll call Sue, stopped two overweight bystanders who were planning to "run" two hours off the mountain to summon "HELP!" Sue then assessed the patient and determined his most serious injury was probably a lower leg fracture and that the lumbar spine might also be involved.

A patient history revealed no relevant data except that he had not eaten since breakfast and had only two cups of coffee to drink all day. The time of the accident was around noon; it was now about 12:20. The air temperature was near 85°F and it was a typically muggy June day in Virginia.

The patient was sweating profusely, had a heart rate that ranged between 72 and 80 and a respiration rate near 18, except during several periods of hyperventilation. Sue controlled the hyperventilation, which had progressed to the point of causing his fingers and toes to feel tingly. After his distal sensations had returned to normal and Sue had determined that the patient had not lost consciousness, she made the judgment that his cervical spine was probably not compromised.

After sending a detailed SOAP note out with four strong hikers, Sue organized the remainder of her untrained group to care for the patient. First they moved him to a more secure location and erected a tarp to shade him from the sun. Then they fed him bits of fruit and candy and encouraged him to drink water, of which he was able to take in nearly two liters during the 6 hour wait for rescuers. At one point, Sue administered 800 mg. of ibuprofen in an attempt to relieve the patient's pain, which was considerable.

When rescuers arrived around 6 p.m. the students assisted in a litter evac to a point where a helicopter could pick the patient off the mountain. After several months recovery and rehabilitation, the patient recovered from his injuries, which aside from minor abrasions and contusions, consisted of a broken tibia/fibula, fractured in three places.

Was the patient care reasonably good? Yes.

Was the approach to the event ethical and humane? Yes.

Did the care fit into any established EMS protocols in the state of Virginia? No.

Was the care legal? Who knows? (Several years ago I may have expanded the answer to read...and who cares?) But, the climate is such that it behooves us all to take the question of legality very seriously.

THE PROBLEM

I recently asked an EMS official, from a state that will remain nameless, what the state's view would be if an EMT reduced a dislocated shoulder in a remote environment. The immediate response was, "That person would go to jail."

"Come on," I said, "you can't tell me that a humanitarian act that resulted in the relief of suffering and the potential saving of a limb would result in jail time."

"Our state's policy and practice," the person continued, "is to investigate and prosecute to the fullest extent of the law any acts that were performed outside a person's scope of practice. Well, it may not ultimately result in time served, but it would certainly lead to the loss of licensure."

That kind of black-and-white perspective, while not universal, is prevalent. In the following text, from a different state, we see yet another example of misunderstanding, distrust, and in the final paragraph from which we quote, glowing inanity.

RC 020610

"Dear Mr. Doe:

"This is in response to the 'Application for Approval' and attached materials received here on January 13th, concerning the Wilderness First Aid course. Unfortunately the Wilderness First Aid course does not qualify for (the state's) EMT recertification credit hours. The materials submitted to this office previously indicate that this program contains information and/or practices that are not within the written roles, responsibilities and/or level of training of EMT's in (the state).

"In addition, some of the material contains information and/or practices that may violate certain state laws and/or regulations regarding the practice of medicine and/or exceed the scope of practice of the EMT in (the state).

"The course does not appear to address the specific medico-legal problems that may occur, should an EMT in (the state) utilize certain practices and/or procedures listed in this program. In addition, the program does not appear to point out which practices and/or procedures may be prohibited in certain states, with any specificity.

"Finally, there are no federally designated 'wilderness' areas in (the state) that we are aware of. Practice of these 'wilderness' techniques are apparently not permitted under current state law."

Certainly, the refusal to allow continuing education hours is reasonable, given the role of an EMS bureau and the standards it is charged with maintaining. The final paragraph, however, does seem to tread the fine line between trivial bureaucratic finger-wagging and outright threat. While no simple answer to the problem of backcountry care exists, we clearly need to look elsewhere than extremist views expressed in the simple-minded arrogance of pseudo-legal language.

A QUESTION OF ETHICS

I am inclined to wonder whether we have for too long been trying to pound the irregularly shaped peg of backcountry care into the square hole of an EMS system designed to handle the behavior of EMT's on the street. Most of the wilderness trained EMT's and WFR's I know make their living as backcountry trip leaders. They sought out training not to ride an ambulance but, rather, to get as far from pavement and automobiles as they could.

Any backcountry trip leader doing his or her job well functions more often as counselor and country doctor than as EMS provider. Yet they are certainly not doctors; nor do they wish to be. They function as they do out of need. Being responsible for a group in the outdoors requires wearing many caps, whether or not those caps fit. Most of the leaders I know go out of their way to stay as well trained as possible, which often means learning a little appropriate medicine here and there.

The difficulties are not only in the province of lay providers. Writing for physicians, Kenneth Iserson states, "Wilderness medicine, however, is not directly comparable to either the medicine delivered in health care facilities or even to care delivered by common (urban) emergency medical services. Wilderness medicine is unique, and its special attributes provide unique ethical problems" (Source: "Ethics of Wilderness Medicine" chapter 56 in *Wilderness Medicine: Management of Wilderness and Environmental Emergencies*, ed. Paul S. Auerbach, 3rd. ed., 1994, p. 1436).

THE LINK BETWEEN EMS AND WILDERNESS MEDICINE

Few states, if any, have specific statutes that govern the practice of backcountry medicine by non-physicians, and trip leaders certainly do not fit into the licensure system for physicians. Therefore, wilderness types, by default, find themselves looking to the EMS system for guidance, and they do find some.

First, current wilderness medical training is based firmly upon good emergency care. It makes eminent sense to train wilderness providers to the same level of competence as street EMS folks in managing the A,B,C's, splinting, patient assessment, and other basic skills. Therefore, these traditional first responder and EMT courses have formed the basis for wilderness courses, which then add on extended-care and certain environment-specific issues. Many wilderness EMT's have acquired good, hands-on, patient management skills by serving time on ambulances. To do that, of course, requires state-licensure, which is the point of entry into the "system."

Second, as researchers learn more about emergency medicine they make recommendations as to how EMS providers should handle patients in the field. Because of the dearth of wilderness patients compared to the high numbers churned out by our cities and highways, most research is urban-based. For example practically any recent copy of JAMA or JEMS will have an article, or two, about the efficacy of shaving not minutes but seconds off response times—important for the Baltimore paramedic? Absolutely. Irrelevant for the Wilderness EMT? Of course.

Sometimes, however, urban research does give us useful data. For example, it was only through studies done on thousands of patients that we've finally developed a rational protocol for "clearing" potential c-spine injuries in the field. So, for the better, and sometimes for the worse, we seem inextricably linked to urban EMS systems.

In some places, formal EMS systems seem to be making their way successfully into the realm of wilderness rescue. New Mexico, for example, seems to be writing a success story with the state's Mountain Rescue Association team. Here, sympathetic state administrators, state EMS trainers, providers in the EMS system, physicians, and volunteer rescuers are developing a set of true Wilderness EMS protocols that promise to provide good patient care without tying the hands of EMT's who may have to make calls on their own from time to time.

TRANSLATING MEDICAL DECISIONS TO CARE IN THE FIELD

Medicine is a bit science and a bit art. So that field providers neither operate on poor science nor become dangerously creative artists, state EMS bureaus enforce rigid standards for EMT's of all levels of certification. This system allows first-rate medical care to occur on remote stretches of highway all across the country. Those enforceable standards are generally known as *protocols* and usually assume that medical control, a physician, is on-line. In this system, it remains the responsibility of the EMT to have mastered a few limited skills and the responsibility of a medical director to initiate their implementation.

Where radio contact is questionable, or non-existent, some systems provide *standing orders*, which give licensed care providers the authority to initiate specific treatments when they have recognized specific sets of signs and symptoms.

A third, more relaxed, set of standards may be referred to as *patient care guidelines*. These give the provider a bit more freedom to make decisions and may involve more liberal wording. An example of one that is often used within the con-

text of remote care is "If resuscitation through CPR has been attempted with no success for 30 minutes, and ALS is not immediately accessible, consider discontinuing CPR."

CROSSING THE LINE

Beyond the realm of EMS and Wilderness EMS providers, there lies the territory of the wilderness trip leader. He or she has from 16 to 160 hours + of medical training and works in the muddy terrain between emergency care and medicine. He or she certainly has weighty responsibilities, which may include decisions about when to evacuate a participant with belly pain, whether to encourage someone with an injured ankle to walk, and whether to administer his or her personal prescription of epinephrine to a participant. These are confounding questions which have no definitive answers except those provided by the state, which in many cases means positions which are ethically and practically untenable.

This person will do well to follow basic protocols for emergency care when those are truly applicable, but, more often than not, will be required to actually make a decision or two. While many situations are predictable, wilderness adventure, by its very definition, implies an uncertain outcome. Medical directives could not possibly cover the full range of possibilities that could be encountered during any walk in the park. Nor could we, in several lifetimes, remember the text that would result from an attempt at such complete coverage.

Therefore, this person will often operate under a fourth set of standards, which may be referred to as *principles of patient care*, and which have no easily traceable underpinnings in state law. They tend to be too gray for the already obscure fine print of a legal document.

Here is a principle to which most medical professionals would agree:

> "A patient who has an acute abdomen and signs of shock should be evacuated by litter to definitive care and, if conditions permit, should take nothing by mouth."

Where does that leave you if:

> you're on a ridge, your patient can walk with assistance, and lightning is imminent?;
>
> or,
>
> your patient is obviously dehydrated, you're 3 days north of East Nowhere, and that fancy new radio you're carrying doesn't seem to be working?

You would seem to be left in the position of making medical decisions without a license. Such situations will certainly force you to pull out the very best you have to offer: compassion, resolve, tenacity, perhaps courage. Who was it that called for the "moral equivalent of war" as the best mechanism by which to develop character? The knowledgeable, experienced trip leader, who also possesses that difficult to define quality we call "good judgment," will certainly fare better than one who lacks one of those qualities.

Perhaps some folks with EMS authority would prefer wilderness emergency care to remain at the bandaid level, which would require that some people endure inhumane levels of suffering; or would prefer that we not administer epinephrine to someone whose airway was closing from anaphylaxis; or would prefer legislation allowing only ER doctors to lead trips beyond the road-head. But I doubt there are many with those views.

I think most EMS folks, and certainly most backcountry providers, merely want a tidy way to make what's reasonable and prudent a part of state law. That process promises to be complex when some of those reasonable and prudent decisions might involve invasive medical procedures and prescription level drugs.

Once again, Kenneth Iserson articulates the damnable nature of the problem for all levels of medical care providers: "Wilderness medical care may be limited by restricting medical practitioners from fully using their skills and knowledge. Paramedics, for example, are told that in some jurisdictions, on pain of losing their licenses, they may not reduce fractures, perform cricothyrotomies, or (in a few backward locations) perform endotracheal intubations. Emergency medical technicians, first aiders, first responders, and the like are more severely restricted. Nurses may not know what procedures their licenses allow, and physicians are constantly concerned about liability. In general, many practitioners in wilderness settings feel that the laws and administrative policies under which they work restrict their actions. This attitude and their subsequent behavior may lead to care for victims of wilderness injury or illness far below the standard that is available. The Wilderness Medical Society and other groups have begun working to overcome these limitations. At present however, an ethical dilemma may exist when practitioners face a medical situation in the field that they know how to treat but that exceeds their license or official certification. A clear conflict may exist between the law and ethical responsibility. Practitioners have to decide the best course of action—preferably in advance of the problem." (Source: "Ethics of Wilderness Medicine" chapter 56 in *Wilderness Medicine: Management of Wilderness and Environmental Emergencies*, ed. Paul S. Auerbach, 3rd. ed., 1994, p. 1443).

WHAT THE WILDERNESS PROVIDER CAN DO

Consider the following steps and ask the following questions:

Ensure that you have first-rate backcountry travel and survival skills for the specific environment in which you work.

Get and maintain top-quality medical training, which is regularly updated to the standards of the day given your working environment (Wilderness First Aid?, Wilderness First Responder? Wilderness EMT?).

Formulate solid principles of patient care upon which to base your judgments, and rehearse the big calls before you need to make them.

Sharpen and use your documentation skills.

Understand how to involve other rescue personnel should the situation require it.

Develop a supportive network that includes a physician, a state EMS or Health Department contact, and an attorney. In concert with that team, develop patient care guidelines for all invasive procedures and the use of OTC and prescription meds. Tread lightly, see "One Final Consideration" (next page).

Consider purchasing a professional liability insurance rider through your homeowner's policy or a professional organization.

Exercise always the compassion that will cause you to act with the best interest of your patient at heart.

IN ADDITION, WHAT AN OUTDOOR PROGRAM CAN DO

Start by asking the following questions:

- What is being done by other programs who work in environments and with populations similar to yours?

- What levels of certification should various components of the staff have or, perhaps, not have?
- How is your work tied to the state's EMS system and/or Department of Health? Does it have any regulations you should know about? Does it have any you should seek to have changed?
- Are there any provisions for a physician to "delegate" practice to another level of licensure? (This provision might meet some needs)
- Who in your state is sympathetic to and understanding of your needs given the environment in which you work?
- In what ways can you participate in local and national data collection (we are going to need it) and legislation that will lead to resolution?

IN THE MEANTIME, WHAT IF SOMETHING HAPPENS

If you've broken a state law, you've broken the law. No court will entertain your ethical and practical arguments, however sound they may be. However, in a civil suit you'll have some leeway. If you take some action in the backcountry, you'll probably be judged by whether or not you acted as a "reasonable and prudent person" would have acted given the same level of training and the same set of circumstances. To figure that out, the lawyers on both sides will lead in a parade of experts to disagree with one another over the finer points of your closely scrutinized behavior under pressure. And you know the series of questions they'll consider: Was there a duty to act? Did the act or omission cause injury? Was it negligence or was it gross negligence? What percentage of responsibility did you have?

Relatively little precedent setting case law has determined what we should and should not be doing in the backcountry. If we wait for the "reasonable man" concept to be tested often enough in the court for a body of case law to be amassed, the road to legal recognition will be long and tortuous. And, of course, it is unreasonable to expect outdoor programs to face constant ethical and medico-legal battles until things are resolved.

In the spirit of helping the system evolve to a sustainable and comfortable level, I invite readers to share their successes, and failures, at navigating the labyrinth. In the case of the former we'd like to make you a hero; in the latter, we promise anonymity.

ONE FINAL CONSIDERATION

Although we've seen a few examples of frightening encounters with EMS systems, remember that the field is populated with caring people who have dedicated their lives to serving others. In many cases those people, by virtue of their positions, have an obligation to the states for which they work to make sure that state law is not being trampled. You may argue practicality and ethics, but they are professionally obligated to uphold the law. Therefore, it would be unwise to begin by telling them all about how you run your program; however sympathetic they may be to your cause, they may have the duty to investigate and report what you are doing. Rather, approach with an ear to learn what they have to offer and, then, speak in hypothetical language. You may not hear what you want to hear, but at least you will "do no harm," and that, after all, is our single, inviolate ethical and medico-legal premise.

THE FUTURE OF WILDERNESS EMERGENCY MEDICAL TRAINING: SCATTERED OR SELF-DETERMINED?

by Buck Tilton

At last fall's Wilderness Risk Managers Conference, some conferees discussed the need for standardization and certification of wilderness medical training for lay providers. The group included representatives from SOLO, Wilderness Medicine Institute, Wilderness Medical Associates, the Wilderness Medical Society, and others who provide emergency medical training with a wilderness focus. Those in attendance generally agreed that several significant issues are at stake:

1) Because more and more organizations are beginning to offer training, students have no way to judge the value or appropriateness of the newer schools. This rising number of options also complicates recertification (i.e. if a school does not know what a student has learned previously, that school is justifiably reluctant to offer to recert that student).

2) The new national standard curriculum for EMT's is in some ways less suitable for wilderness applications than was its previous incarnation (see "The Revised EMT-Basic Curriculum" in this issue). This issue complicates using the revised EMT-B curriculum as a basis for W-EMT training.

3) Individual states, who have tightly controlled requirements for medical training, will have no choice but to become less friendly to all organizations offering wilderness medicine certifications if the training standards are generally loose or if instructional quality is not controlled.

Canada has recently undergone the process of standardization and certification, and from the accounts of the Canadians at this meeting, they believe that their product is a good one and is worth the struggle it took them to produce.

Dave Secunda, of ORCA, volunteered to coordinate the initial meeting, which will include SOLO, WMI, WMA, and the WMS. This group will meet in early March to flesh out the issues in an attempt to create a thoughtful agenda for discussion by any and all interested parties. This first meeting is not meant to be exclusive in any way; rather, it will allow those with the most experience in the field to examine organizational differences and to create a reasonable process whereby all voices can be heard. The results of that meeting should be available by April, in preparation for an open meeting scheduled for August 8th in Boulder. If you have a stake in the process, make every attempt to be at the August meeting or to forward your contributions through someone who will be there.

The issues here are significant for lay medical providers and for wilderness educators and programmers. Nothing will change too rapidly, but things will change. The following text is excerpted from a letter sent to the steering committee by Buck Tilton, Melissa Gray, and Dan DeKay of the Wilderness Medicine Institute. It represents the Institute's position on the standardization vs. certification issue.

"Much thought and discussion has followed ORCA's invitation to the steering committee meeting scheduled for March, 1995. We considered it important to share some of our

thoughts with you.

"For wilderness medicine to move finally from the status of the 'bastard child' of pre-hospital care to the position of a respected medical field (such as NREMT's), we as trainers eventually need to establish not only standards but also ways and means of accreditation. If we provide the world with standards without accreditation then we have created a vehicle for anyone, regardless of experience and training, to set up wild med courses without any assurance of quality to the potential student of contracting organization. Standardization of curriculum guarantees absolutely nothing. Toward what advantage do we work if we do not work toward accreditation?

"Today WMI accepts students into refresher/recertification courses if they have a valid and appropriate wilderness medicine card from SOLO, NOLS, WMA, or NASAR. We do so out of respect for those schools, knowing already the high quality of curriculum and training provided there. Standardization of curriculum will be of no advantage to students from the standpoint of recertifying through us.

"Each of the schools represented by the steering committee has proven itself worthy of certifying students in wild med: worthy by curriculum; worthy by instructional staff; worthy by history. Would not the field of wild med be improved if everyone teaching wild med be held to similarly high standards? Curricula consistent with expert medical opinion, experienced and educationally qualified staff, performance tested graduates, and thoughtful cooperation with state agencies have distinguished the programs we've mentioned, and to be sure, there are some others equally sound. What does the future hold?

"We need far more than a national standardization of curriculum. We need national accreditation for trainers and eventually a national board of wilderness medical education and a national registry of wilderness medical providers (WFR's, WEMT's). From the unified base of a national wild med registry we can appeal directly to state bureaus for reciprocity, assuming our standardized curriculum meets all the required training demands of each state. We see great advantages to the field and to each individual school."

The *Wilderness Medicine Newsletter* welcomes your opinion and is eager to prove a forum for the discussion of these important issues.

THE REVISED DOT EMT-BASIC CURRICULUM: HOW WILL IT AFFECT THE WILDERNESS PROVIDER?

by Ken Thompson

In mid-1994, the long-awaited revisions to the EMT-B National Standard Curriculum rolled out of the darkness and into public view. The revisions represent the hard work of many researchers, physicians, and EMT's of all levels, led by principal investigator Walt Stoy, PhD, EMT-P, whom we interviewed for this article.

The updated DOT EMT-B curriculum promises to improve training, inter-state reciprocity, and, of course, patient outcomes for street-based, out-of-hospital care. It was driven by a newly formulated master plan, referred to as the national blueprint, which is intended to create greater cohesion and standardization among all levels of prehospital providers. Some states have already begun to adopt the new standards. As many as 35 may be on board by mid-1995.

The revised curriculum will have implications for the training and certification of Wilderness-EMT's, changes whose exact nature remain to be seen. Nevertheless those of you who trained as EMT's under the 1984 curriculum might be interested in the new directions. Knowing the content and approach of the revised curriculum may inform your decisions about updating your backcountry skills.

— One over-arching concern addressed at every level of the curriculum has been the improvement of teaching. Lessons have been designed with specific guidelines for instructors and include a "new" approach designed to engage the learners' audio, visual, and kinesthetic perceptions.

— The revised curriculum aims at making Basics fully functional as rapidly as is practical (110 hours) while preparing them with sound enough assessment skills that they can readily ascend the ladder of certification through continuing education.

— Since rapid defibrillation is of utmost importance for cardiac emergencies, Basics will now be trained in the use of Automated External Defibrillation (AED), in which the EMT connects the patient to a machine which makes all the critical decisions and does all the work. The amount of time required to learn how to use AED is between 4 and 10 hours. One recent study reports that, even prior to implementation of the 1994 curriculum, "...early defibrillation coverage in urban, suburban, rural and wilderness settings is increasing at a steady pace." (Access to Early Defibrillation: The Latest Stats, by Mary Newman, *JEMS* Feb 1995, Vol 20, No 2).

— Basics will carry and use, with medical direction, oral glucose and activated charcoal and will be able to assist patients with physician-prescribed nitroglycerin, inhalers, and epinephrine. Basic pharmacology of those specific medications is part of the curriculum.

— Based upon considerable recent research on the efficacy of the Pneumatic Anti-Shock Garment (PASG), that device is now taught for use only for patients having unstable pelvic fractures associated with hypotension.

— The term fracture does not appear in this curriculum. Instead, a fracture is referred to as "a painful, swollen, deformed extremity." The thinking is that for short-term, out-of-hospital care, where the patient will receive rapid transport to definitive care, no more thorough assessment is necessary.

— There is a greater emphasis placed upon the developmental considerations of infants and children, who will no longer be referred to by the less specific term, pediatrics. Airway problems of infants and children and methods of airway management receive renewed consideration. Greater emphasis is placed upon the most common injuries little folks receive.

— There is new emphasis placed upon ventilating patients whose breathing is inadequate or labored; previously, the 1984 EMT-B curriculum include ventilation only for the patient in respiratory arrest.

— Since definitive airway management is one of the most critical and time-sensitive skills in emergency care, the revised curriculum includes a 12-hour, optional module in advanced airway management. The module includes "the Sellick

maneuver, orotracheal intubation, in the adult, child and infant, confirming endotracheal tube placement and securing the endotracheal tube."

— The new approach is almost entirely assessment-based, compared with the 1984 curriculum, which was more diagnostic-based. This approach emphasizes the recognition and treatment of immediate life threats, while it lessens the importance given to specific problems that cause those threats to life.

It has been this shift of emphasis away from understanding how the body functions, that has caused the greatest concern among wilderness providers, whose business is often long-term care. The following explanation of the shift comes from an article printed last year by *JEMS:*

"A shift in philosophy from previous curricula manifests itself in the depth of anatomy and physiology presented to the student. The new approach is to limit the amount of instruction required for anatomy and physiology to only what is necessary to provide quality prehospital care. The philosophy is one that emphasizes the importance of need-to-know information vs. nice-to-know information. In other words, when developing the Human Body lesson plan, the authors asked themselves the following question, 'What will be the detrimental effect to the care of the patient if we eliminate certain extraneous components of the anatomy/physiology lesson?' If the answer was 'no detrimental effect,' the topic was considered nice-to-know and was not included as an essential element of the knowledge domain of EMT-Basics.' For example, when considering the inclusion of the spleen within the lesson plan, the authors first had to determine if the omission of the topic would have a detrimental effect on patient care provided by EMT-Basics. Since it was determined that the omission of the spleen's anatomy and physiology from the educational program would not have negative impact on patient care because EMT-Basics could treat the patient's signs and symptoms without in-depth, specific knowledge of the spleen's anatomy, the topic was considered nice-to-know and excluded from the essential elements of the lesson plan." (Source: A special supplement published by *JEMS* in June, 1994. Reprints of this excellent introduction to the philosophy and contents of the new curriculum may be ordered by calling JEMS at (800) 266-5367.)

Author and rescuer Tom Vines articulates his concern about this shift in emphasis within a book review of Dr. Warren Bowman's acclaimed *Outdoor Emergency Care; Comprehensive First Aid for Nonurban Settings.* Vines compares Dr. Bowman's long-term care and advanced diagnosis approach to the assessment-based DOT curriculum. In fact, he refers to the specific omission of the spleen's A & P when he comments: "...in wilderness medicine, where access to advanced life support or even communication with physicians is often absent, this mechanistic approach may not work. It also may be a disadvantage for any provider who must give more long-term care and therefore require a more thorough understanding of the patient's insides. (Source *Wilderness Medicine Letter,* winter, 1995).

The critical element here is the emphasis of need-to-know information over nice-to-know information. The intention of the revised curriculum is to remove time-consuming attempts at differential diagnosis and place greater focus upon treating life threats to enhance patient outcome. Understandably, the research supports getting all critical patients to definitive care as rapidly as possible. Operating well outside the "golden hour," however, Wilderness EMT's may need to make critical decisions based upon a wide range of variables, including the location of and function of various organs. Will WEMT upgrade courses that have previously built upon the foundation established by the DOT now need to build their own foundation of basic anatomical and physiological understanding?

Dr. Stoy was quick to point out that the revised standards set minimum guidelines which must be taught but that individual states and teachers are encouraged to add on whatever they deem necessary for their particular circumstances. In fact, much to its credit, the new curriculum generally emphasizes the need for continuing education and the regular updating of skills.

It remains clear that training at the lowest levels of licensure within the field of EMS is growing more mechanistic and technology-dependent, placing heavy emphasis upon the "technician" part of Emergency Medical Technician. Perhaps the essential question we must ask is whether wilderness providers must, instead, emphasize the word "medical." A distinction that would sharpen our focus upon levels of knowledge appropriate for the decisions we are regularly called on to make.

THE MEDICINE CHEST

SKIN AND SOFT TISSUE INFECTIONS — CELLULITIS

By Frank Hubbell, DO

A superficial skin infection is know as a cellulitis. Cellulitis occurs when bacteria is able to breech the barrier of the skin and begin to multiply. Our skin is our first line of defense against the possibility of invasion and infection. It is a water proof, bacteria proof, breathable membrane, that as long as it is intact, will work to guard us against invasion by the bacteria that is living on our skin.

The two most common bacteria living and thriving on our skin are Staphylococcus aureus (S. aureus) and group A B-hemolytic streptococci (GABHS). When the skin suffers an insult or injury such as an abrasion, laceration, or blister the protective barrier has been violated allowing these microscopic organisms to get beneath the protective barrier into a more hospitable environment, thus making us part of the food chain. A principle to live by is always try to avoid becoming part of the food chain on any level.

Once these bugs have invaded our dermis and begin to thrive and multiply, a second line of defense occurs that is designed to kill those bacteria, which is known as an inflammatory reaction. First, the blood vessels in the area dilate, allowing more blood into the site of invasion bringing with it more white blood cells (WBC's). WBC's are cells that actively seek out the invading organism and devour it. This increase in circulation is recognized by the increased redness in the area, warmth, and swelling. As the population of WBC's increases they become obvious as purulent material or pus.

If the first line of defense has been breeched, the skin, and the second line of defense, the inflammatory reaction, become overwhelmed by the invading organisms — then the infection will begin to spread. The area of redness will increase in diameter and the infection will get into the lymphatics and begin to move up the extremity toward the heart. Lymphatic spread is an ominous sign. It can be seen as a red line moving up the

extremity and felt as swollen, tender lymph nodes at the joints.

If the infection is allowed to run its course it will eventually reach the circulatory system and the heart. Within about one minute of reaching the heart, the infection is spread body wide. The individual will develop a high fever, shaking rigors/chills, and extreme weakness. Death can occur in as little as 24 hours.

The key to success is prevention by proper wound care and cleaning the wound at the time of injury. If however, the signs and symptoms of a cellulitis occur it is prudent and important to start the patient on a course of antibiotics immediately. The sooner an infection is treated the easier it is to get under control.

ANTIBIOTICS FOR SKIN INFECTIONS

Skin infections — cellulitis, increasing redness, warmth, swelling, and pain secondary to an infection from an abrasion, blister, or laceration.

TREATMENT OF CELLULITIS:

1. Keep the wound and the area around the wound clean and dry. If the individual is not allergic to Iodine, wash the area with a weak iodine or betadine solution twice each day and reapply dry sterile dressings. If it is impossible to keep the area dry then bandage it with dressing that are wet with the betadine solution.
2. If possible soak the infected area every 6 hours with hot water and salt soaks for 1/2 hour each time.
3. Start them on a course of antibiotics that kill staph and strep. The best field choice is cephalexin (Keflex) 500 mg by mouth every 8 hours for 10 days. Other options are erythromycin 1000 mg/day (250mg 4 x's/day, or 333mg 3x's/day, or 500 mg 2 x's/day) for 10 days, or Augmentin 500 mg by mouth every 8 hours for 10 days.
4. If there is an obvious collection of purulent material (pus), then it is very appropriate to open that area with a sharp knife to aid in the drainage of the infectious material.

It is important to be very aggressive with wound care as the smallest wound in the backcountry can become a life-threatening infection in the relatively short time of 2–3 days.

WHO'S WHO IN WILDERNESS MEDICINE

INTERVIEW WITH WILLIAM W. FORGEY, M.D.

By Buck Tilton

No physician has given more leadership, inspiration and plain old priceless time to prehospital care providers in the field of wilderness medicine than William Forgey, M.D., known and loved by too many to count as "DOC" and dubbed by peers and faithful followers alike as the "Father of Wilderness Medicine." Born in 1942 and graduated from Indiana University School of Medicine; after serving as an infantry captain, Doc established a private family practice in Merrillville, IN, a practice he continues today.

His unprecedented effort, *Wilderness Medicine*, was first published in 1979 and endorsed by legendary outdoorsmen Calvin Rustrum and Paul Petzoldt. Why unprecedented? Doc went way out on a limb to recommend and teach "advanced level" techniques (e.g. suturing, drug therapies) to non-physicians. Now in its Fourth Edition, *Wilderness Medicine* has been joined by numerous other books including *Basic Essentials of First Aid for the Outdoors, Basic Essentials of Hypothermia, The Travelers' Self Care Manual, Travelers' Medical Resource, Hypothermia: Death by Exposure*, and the delightfully entertaining *Campfire Stories*. Doc's books are available from ICS BOOKS, Inc., 1370 East 86th Place, Merrillville, IN 46410; (800) 541-7323.

Doc maintains a schedule not only astounding but virtually incomprehensible to someone used to a 40-hour week: Clinical Assistant Professor of Family Medicine at Indiana University, adjunct faculty positions at Slippery Rock University and Western Illinois University, trustee and advisory board member of the International Association for Medical Assistance to International Travelers (IAMAT), trustee and treasurer of the Wilderness Education Association, advisory board member of the Wilderness Medicine Institute, editor of the 1995 Position Papers for Pre-hospital Care of Wilderness Injuries for the Wilderness Medical Society, Fellow of the Explorers Club, and leader of numerous expeditions into northern Canada.

WMN: **Doc, what do you consider your most significant contribution to wilderness medicine?**

DOC: I insisted on a distinction between wilderness first aid and urban first aid back when making such a distinction was distinctly unpopular, especially among physicians. I still make that distinction. Those of you who are in the trenches treating real emergencies in real wildernesses have always needed more liberal knowledge and permission to do what needs to be done.

WMN: **What do you consider the most critical wilderness medicine problems today?**

DOC: I think hypothermia has probably been the most significant problem for a long time. I consider the explosion of tick-borne diseases, the deterioration of ground water and the staggering rise in melanoma due to exposure to the sun all to be critical problems.

WMN: **If you were a medical advisor to an outdoor program or wilderness-oriented organization, what guidelines would you offer for the treatment of hypothermia?**

DOC: I'd start by reminding them that hypothermia is preventable. Too many people are still wearing cotton in cool damp weather, which I call "thermodynamic nudity." Too many people are not drinking enough water, not eating enough, sweating too much and not paying attention to the subtle early signs of hypothermia.

If hypothermia developed in a patient, I'd tell them the most important treatment is to replace the lost heat. Replace all damp clothing with dry clothing. Shelter the patient from wind and rain. If the patient is conscious, warm fluids may be given by mouth...and simple carbohydrates. A large reflecting fire or sitting in sunlight would add heat. Heat packs or hot water bottles or even warm rocks, all wrapped in dry clothing and placed against the patient, would replace lost heat. There's no secret: replace the lost heat.

WMN: **Doc, are you willing to have WMN readers write to you with their wilderness medicine questions?**

DOC: Sure. No problem.

William W. Forgey, M.D.
812 North West Street
Crown Point, IN 46307

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

MARCH/APRIL 1995 ISSN-1059-6518 VOLUME 6, NUMBER 2

OUTDOOR LEADERSHIP-- PAST AND PRESENT

by Ken Thompson

Having just reviewed about fifty resumes to fill one position, I am reminded of the substantive evolutionary changes we've seen in the field of experiential education in the past half-century, and of how difficult it has become to figure out who can travel in the backcountry with enough skill to lead others.

Before Outward Bound arrived in the early 60's, "outdoor education" was merely "adventuring", a throwback to the days of exploration when there still were untrammeled hillocks upon which to pitch a tent and pure streams from which to pull native fish. We knew how, back then, to travel in all the easily accessible places; we'd floated the navigable rivers, climbed the highest peaks, and explored countless square miles of pristine forest. Having run out of wild places to travel in the natural landscape, we turned inward in search of adventure. Now, serious rockclimbing starts at 5.11; kayakers often play with the big rivers and must seek ever higher waterfalls to test their mettle; and a select, but ever-increasing, few don't call adventure "adventure" until they find themselves alone near the South Pole on a pair of skinny skis.

But, what about the novice, the amateur, the lover of quiet places, the child who seeks only the solitude that what's left of the wilderness can provide? How do we figure out whom to trust to lead these gentler souls into the land of enchantment? Do we hire the 21-year old 5.12 climber, or the 50-year old successful math teaching canoeist, who has decided to pursue a living on the Boundary Waters, because there she can find a paycheck, as well as her heart.

The first generation outdoor educator--Paul Petzoldt, Willie Unsoeld, Eric Langmuir--was an outdoorsman first. He satiated his quest for adventure and then, only then, did he take to a "career" in showing others the way. Time on the crags, from which he survived, made him an instructor, or perhaps a mentor to those who followed. And who followed? Mike Gass, Craig Doblin, Buck Tilton, Rita Yerkes, Bunny Johns, and Jasper Hunt are a few who come to mind. They earned their privilege to teach by being there, by taking what the pioneers had to offer and bringing it to the academy, by translating the joy of climbing a peak into the theoretical world of the classroom and then taking it back again. That process involved work: physical work, emotional work, intellectual work. By having done that work they grew thoughtful, intentional, and trustworthy.

But what of today? Most of the applications I reviewed were from folks who possessed either bachelor's degrees in adventuring, or bachelor's degrees in something else and loved adventuring. Is this a person who's first thoughts fly to the magnificence of the terrain, or to the miracle of those to whom he's responsible? Who's to know what he knows? He seems to be in love with the idea of working outdoors, but what of his judgment? I know how many times he has summitted; but, how many times has he turned back?

Is it possible to determine during an interview whom to trust with the lives of the inexperienced and the future of a program? I don't know. But, we've reached the point where technical skills should be taken as merely a starting point, experience must be present in healthy measure, and familiarity with current standards an accepted prerequisite. If a candidate with a bachelor's degree in travel doesn't have these things, we're all in trouble.

Show me someone who is sensitive, who listens, not just attends, to my every word and gesture. Does she hear me? Can she let down her defenses to the point that in the short space of an hour we reach some understanding about each others' values? Or does she seem more intent on telling me about the details of the swiftwater rescue course she took in North Carolina. Frankly, I care most of all about her ability to see right to my core. Because, if I'm going to entrust her with the care of an eighth grader on class II water, I want

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someone who can understand the child as well as she does the river.

Her sensitivity must extend beyond me to the natural environment. Does she marvel at the change of light as the sun slants from overhead into afternoon? If she does, she'll probably recognize when clouds are building and bringing the threat of lightning with them.

Show me someone who is sincere, who tells me that she doesn't know everything she needs to know. I fear nothing more than person who has a "no problem" attitude towards life. The vagaries of people traveling in a natural environment produce endless combinations of circumstances. Things can go wrong in ways that they've never gone wrong before: the hazards can't be planned for, can't be anticipated, they can't even be imagined. Does this person make that humble acknowledgement?

Show me someone who is creative. Paul Petzoldt's famous line is "rules are for fools". How will the candidate handle the anomalous situation for which there are no protocols? Can she keep a dozen soggy tenth graders alive and happy on a stormy September night with no tent, no stove, and no survival manual?

Show me someone who is succinct, but who tells a good story. Can she sum up the essence of an event so that its meaning seems written in neon? Can she let me know all the salient details of an accident without telling me how everybody in the group felt about it? If so, she can probably write a reasonably readable SOAP note. Does she understand the relationships between seemingly disparate details? If so, she may understand the why behind the what.

Technical skills are mere tools; experience can be bought; as can credentials. Sensitivity, sincerity, creativity, and communication skills are equally important and much harder to find.

PREVENTION VS. CRISIS INTERVENTION... A LOOK AT OUTDOOR LEADERSHIP

By Ted Walsh

What makes a good outdoor leader? Clearly, a lot of different qualities - and therein lies a problem. In this world of formulas, protocols, regulations, and techniques, very few people are comfortable with the idea that no two situations will be exactly alike. Yet the essence of good outdoor leadership is the ability to step into a totally new situation, provide a common vision for the followers, enlist their enthusiasm, and provide the tools to reach that vision.

The good news is that there are a lot of people out there who do this very well day after day. Sadly, we do not hear about these people or their skills often enough. It is rare that a participant in an outdoor program has the experience or knowledge to realize how many potential dangers, mishaps, or unhappy experiences were avoided through good leadership. Safe trips do not make the evening news. Unfortunately, accidents do. The result too often is the belief that knowing how to handle an emergency is all that is needed to be a leader. This is a dangerous perception, first and foremost, because the far more important issue of prevention is put aside; and second, when someone has been trained exclusively in crisis management, the natural tendency is to either ignore potential problems until they reach crisis or fan the flames of a minor problem so that it becomes a crisis, because this is what they know how to deal with.

This does not mean for one moment that outdoor leaders should not have a solid knowledge and experience of wilderness emergency medicine. What it does mean is that emergency medical principles need to be taught to outdoor leaders as skills that are important, but that, hopefully, only represent the smallest percentage of what they actually spend their time doing as outdoor leaders. Far more emphasis should be put on prevention, but that, too, is a subject to be examined.

A lot of outfitters, guides, and schools believe that having lots of rules about what participants may and may not do is good prevention. It would be, if it worked. Unfortunately, far too many of us don't even listen to the rules, much less follow them if we don't know the reason for those rules. You want good prevention? First, make sure outdoor leaders have the technical knowledge to be in the backcountry. Skills like understanding weather, navigation, animal habitats, and minimum impact camping are a must. Second, but just as important, spend time working on teaching skills; presentations, confrontations skills, how to provide structure, how to evaluate, and how to critique. These too are a must.

If you don't want the people in your program to suffer from cold injuries the best prevention is to be sure the leader is good at teaching people about regulating body temperature, the advantages of different types of clothing, the dangers of dehydration, the importance of keeping dry, and the early warning signs of cold injury. Sound like a lot of work? It can be, but it is effective, and is less work than treating cold injuries. If this works, then why is it not the standard expectation of outdoor leadership skills? Perhaps because we do live in a world of formulas, protocols, and regulations the expectation of the follower is that "you tell me what boot to buy, then my feet will be warm." Likewise some outdoor organizations feel that if we require our clients to have certain clothing, they will be warm. This is a lot simpler than doing all that teaching about the cold; however, it does not have nearly the success rate. Having equipment without the knowledge to use it is not prevention.

So what does it take to be a good outdoor leader? It takes a lot of work, and if you enjoy the constant teaching, rolemodeling, and learning about other people, it is very rewarding work. The best outdoor leaders are the ones who can manage any kind of crisis, but seldom have to.

HIGH ALTITUDE ILLNESS

By Frank Hubbell, DO

When individuals go to high altitude, having not acclimatized to high altitude, they are at risk of developing one of the acute high altitude illnesses. These maladies are on a spectrum from mild and self-limiting to severe and potentially life-threatening. The exact mechanism by which these illnesses occur is uncertain. However, the preventative measures to minimize the risk, the symptoms they present, and the treatment modalities are well understood. The three primary high altitude illnesses are Acute Mountain Sickness (AMS), High Altitude Pulmonary Edema (HAPE), and High Altitude Cerebral Edema (HACE).

Acute Mountain Sickness (AMS) usually occurs within 4 - 6 hours of attaining altitude, but its onset can be delayed for up to 24 hours. It normally occurs at altitudes of 8000' or more but can occur as low as 5000'.

Symptoms of AMS are mild to severe headache, nausea with or without vomiting, a sensation of shortness of breath, fatigue, loss of appetite, dizziness, insomnia, and occasionally Cheyne-Stokes breathing while sleeping. These symptoms are usually mild but the headache, nausea, vomiting, and fatigue can progress to severe.

Treatment of AMS involves hydration, rest, a mild pain reliever, and the tincture of time. Symptoms are becoming worse if the patient develops a severe headache and vomiting or if there is no improvement within 24 hours. In either case it is then necessary for them to descend. A descent of 1000' is usually enough to reverse the symptoms of AMS. Once the symptoms have abated, resting for 24 hours before returning to altitude will minimize the risk of AMS returning.

Drug therapy: Diamox (acetazolamide) may be used in the prevention or amelioration of symptoms. For individuals at risk for AMS (those with a history of AMS or those making a very rapid ascent), Diamox may be taken to prevent AMS. For prophylactic therapy of AMS, take 125 - 250 mg by mouth every 12 hours. Drug therapy should be started 24 hours before going to altitude and continued for 3 days once at altitude. In the treatment of AMS, 250 mg should be taken by mouth every 6 hours until the symptoms resolve.

It is important to remember that Diamox is a sulfonamide compound; therefore, individuals allergic to "sulfa" drugs such as Bactrim, Septra, or TMZ/SMX should not take it. Diamox has also been known to cause a severe allergic reaction (Stevens-Johnson Syndrome), so anyone who is going to use this drug should take a trial course before going into the wilderness away from immediate help.

Dexamethasone, an anti-inflammatory steroid, may also be used to treat AMS. The dose is one 2 - 4 mg by mouth every 6 hours until symptoms resolve.

High Altitude Pulmonary Edema (HAPE) can occur at altitudes as low as 8000' but is more common above 14,000'. HAPE is an accumulation of fluid in the lungs that makes breathing very difficult.

The symptoms of HAPE include increasing shortness of breath, dry cough that may become productive as symptoms worsen, rapid heartbeat, and extreme fatigue. On physical exam there will be crackles in the lungs and possibly peripheral edema. The condition is painless; if pain is present, be suspicious of an injury or infection.

Treatment of HAPE: Immediate descent of at least 1000', but usually 2000' - 4000' to relieve symptoms; keep the patient hydrated; give oxygen if possible; avoid physical activity if possible, and keep them warm. If it is impossible to descend, then use the Gamow Bag (portable hyperbaric chamber) until descent is possible.

Oxygen therapy: 4 - 6 liters per minute until improvement then 2 - 4 liters per minute during evacuation to lower altitude.

Drug therapy: Drugs are of limited value because oxygen and descent are so effective. Diamox (acetazolamide) 250 mg by mouth every 6 hours, and Dexamethasone 8 mg by mouth followed by 4 mg by mouth every 6 hours. Nifedipine, may be given even though its use has become controversial, because the research has not shown it to be as effective as originally thought. It is given as 20 mg under the tongue or chewed and swallowed, followed by 20 mg by mouth every 6 hours. (Diuretics have not been shown to be useful.)

With improvement the patient should continue to descend and return home. As soon as possible, they should be started on a prophylactic antibiotic to prevent pneumonia. Once home, they should have a chest x-ray and pulmonary function tests which should be repeated in 3 - 6 months in order to determine long-term effects from HAPE. They should not return to altitude for 6 months. After recovery from HAPE, they may go on to develop asthma or the inability to return to altitude.

High Altitude Cerebral Edema is the least common of the high altitude illnesses and is rare below 12,000'. HACE is caused by a collection of fluid around the brain.

The symptoms of HACE include severe headache, changes in level of consciousness, loss of coordination, possible hallucinations, drowsiness, eventual coma, and death.

Treatment of HACE: Immediate rapid descent of at least 2000' - 4000'. If unable to descend, then use the Gamow Bag to stabilize until they can descend. Give oxygen, if available.
Oxygen therapy: 2 - 4 liters per minute with evacuation.
Drug therapy: Dexamethasone 8 mg intravenously, intramuscularly, or by mouth, followed by 4 mg intramuscularly or by mouth every 6 hours.

Essential treatment is to go down and go home. They should have a neurological examination and possible MRI of the head. They should not return to altitude for 6 months.

THE GENERAL PRINCIPLES OF PREVENTION OF HIGH ALTITUDE ILLNESS:

1. AMS, HAPE, and HACE usually result from too rapid an ascent and lack of acclimatization.
2. To minimize the risk, gain an average of 1000' per day. Climb high and sleep low.
3. Take the time to acclimatize, especially upon initial arrival at 8000'.
4. Plan rest days to recover and catch up.
5. Set a pace to avoid exhaustion. The higher the altitude, the longer the recovery.

6. Stay well-hydrated. Overexertion and dehydration increase the risk dramatically.
7. Observe other members of your party for progression of symptoms.

THE GENERAL PRINCIPLES OF HIGH ALTITUDE ILLNESS CARE:

1. When symptoms appear STOP ascent. "Do not go up until the symptoms go down".
2. If condition worsens or no improvement in 24 hours, go down at least 1000'.
3. Descend immediately, at least 1000', if symptoms of HAPE or HACE occur.
4. Never leave the patient alone and do not allow them to descend alone.

THE MEDICINE CHEST

THE USE OF DIAMOX IN PREVENTION OF ACUTE MOUNTAIN SICKNESS

By Frank Hubbell, DO

Diamox (acetazolamide) is a sulfonamide compound used to treat a variety of medical conditions, one of which is the prevention and/or amelioration of symptoms associated with acute mountain sickness.

Acute mountain sickness (AMS) is a condition that occurs in some individuals when they go to an altitude greater than 8000 feet (2438 meters). Less frequently, AMS can occur at altitudes as low as 5000 feet. Exactly who will develop AMS is unpredictable; however, there are certain conditions and activities that will increase the likelihood of developing AMS. The rate of ascent, the ultimate altitude attained, the level of exertion, cardiovascular fitness, dehydration, and alcohol consumption all contribute to the risk of developing AMS.

Although AMS typically begins within 4 to 6 hours of arriving at altitude, the onset may be delayed up to 24 hours. Diagnosis is based upon history of ascent and symptoms upon presentation. Symptoms may range from moderate to severe. Moderate symptoms include: headache, generalized weakness and fatigue, loss of appetite, mild nausea, dizziness, and insomnia; more severe symptoms; increased headache, marked fatigue, shortness of breath with exertion, nausea and vomiting, irritability, and irregular or periodic breathing during sleep (Cheyne-Stokes breathing).

AMS is a self-limiting disease that is treated with hydration, a light easily digested diet, and limited physical activity until symptoms resolve. Descent to a lower altitude is rarely required. Diamox can also be used in the treatment, but it is more effective when used as a preventative medicine than when taken in the acute phase of AMS.

In the acute phase of AMS, if the symptoms are severe, Diamox may be given in doses of up to 250 mg every 6 hours or 1 gram per day. In individuals where AMS has been a problem in the past or who are planning to make a rapid ascent, then Diamox should be started 24 hours before going to altitude and continued for 3 days once at altitude. The usual dosage is 250 mg every 12 hours.

Since Diamox is a sulfonamide-based compound, individuals allergic to sulfa drugs, such as Bactrim or Septra, should be cautioned that they may have a similar allergic reaction to the Diamox. Diamox can also cause a severe allergic reaction in someone with no known history of allergies to Diamox or sulfa drugs. Because of this, it is very important that anyone planning to use Diamox should take a trial course of the drug before going into a remote location where treatment and evacuation for a severe allergic reaction would be difficult.

DIAMOX is recognized as a viable drug for the prevention or amelioration of the symptoms associated with acute mountain sickness. Proper dosages are as follows: for prevention, one 250mg tablet every 12 hours starting 24 hours before going to altitude and continuing for 3 days once at altitude; and in the treatment of symptoms associated with AMS, it can be used in the same dose or increased to 250mg every 6 hours for severe symptoms until symptoms improve.

WHO'S WHO IN WILDERNESS MEDICINE: AN INTERVIEW WITH CHARLES HOUSTON, M.D.

By Buck Tilton

If your thoughts have ever turned simultaneously to high altitude and medicine, they have assuredly turned to Charles Houston, MD, the man who almost single-handedly fathered high altitude medical research. Long before he rose to medical fame, he numbered among the foremost mountaineers in the world, beginning his career in the 1920s and 1930s with climbs in Alaska, the Alps, and the Himalayas. He ascended Nanda Devi with the fabled Tilman and Shipton and attempted K2 twice including the dramatic 1953 assault chronicled in his book *K2: The Savage Mountain*. "Since then (K2)," Dr. Houston humbly says, "I've only made a few treks in the Himalayas and elsewhere."

"My career in mountain medicine," continues Dr. Houston, "started on the Nanda Devi expedition in 1936, continued as a flight surgeon in WWII, and evolved into the Mount Logan High Altitude Physiology Studies (1967-79), Operation Everest I and II (1945 and 1985), and the Colorado Altitude Research Institute (1987-91)."

Dr. Houston's unprecedented Operation Everest studies were performed on volunteers taken via an elaborate hyperbaric chamber to a simulated altitude of 30,000 feet where they lived constrained but active lives and underwent specialized and indefinitely detailed tests. He boldly went where no one had gone before!

His research and its practical applications appear in six or seven books and perhaps a hundred medical articles written for scientists and/or lay persons. Dr Houston's *Going Higher: The Story of Man and Altitude* (Little, Brown and Company) was the standard work on the subject for years, and his *High Altitude: Illness and Wellness* (ICS BOOKS, Inc., 1370 East 86th Place, Merrillville, IN 46410; (800) 541-7323, $6.99 paperback) is undoubtedly one of the best treatises on high altitude medicine ever written with a lay audience in mind.

WMN: "Dr. Houston, what do you consider your most significant contribution?"

HOUSTON: "My most valuable achievement has been to make the general public, as well as mountaineers, aware of high altitude and how to detect, understand, prevent and treat mountain sickness. My papers on high altitude pulmonary edema and high altitude retinal hemorrhage were pioneering contributions toward safety and health on high places. My role in Operation Everest I and II lead to better understanding of the process of acclimatization. It is fair to suggest that my works have prevented much illness and saved not a few lives. Without doubt my work has spread awareness of altitude illness and saved large amounts of money for those who visit or work in the mountain environment.

"These studies of oxygen lack in a hostile environment have led me to studies of illness and injury which cause problems and death in a normal sea level environment. Although sometimes arcane and sophisticated, most all of the work I have done has had practical, everyday value. I have tried to make it relevant to more than to those who go into the mountains."

WMN: "Are you willing to have our readers contact you?"

HOUSTON: "Though I no longer lecture as widely as I used to, by articles, occasional talks, and the internet, I communicate with many people of all kinds around the world. Understanding of altitude illness is constantly expanding, and my efforts are directed toward spreading this knowledge. More important, perhaps, are my attempts to relate the mountain world to the world we live in nearer sea level. Many people call or write and I am more than happy to communicate with anyone on the subject."

Crevice Entrapment: Medical Aspects

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Over the past several years, the U.S. medical community has rediscovered the "crush syndrome." Reasons include recent U.S. earthquakes, preparation for The Big One in California, and the new emphasis on urban disaster medical care by the Federal Emergency Management Agency. This article lays out the basic medical facts about crush syndrome, and what cave rescuers can do about it. Toward the end, the article discusses entrapment without crushing; this situation is far more likely in cave rescue than in disasters, and poorly studied, but what is known is laid out.

Crush Syndrome

Crush syndrome was a big problem in London during the World War II "blitz" when many people were crushed and trapped under falling debris. Many people were found alive but trapped. Indeed, the people seemed to be doing quite well, having survived days of entrapment. However, as the rubble was taken off their crushed limbs, many suddenly died. Of those who survived, many died a few days later of kidney failure. We now know why this happens and can help prevent it.

When a caver is trapped under a fallen piece of breakdown, or a person is trapped in a building collapse, rescue too often ends with sudden death. Though the person has survived days of entrapment, the sudden release from entrapment allows evil humours" (various poisonous waste products, including potassium, lactic acid, and myoglobin) to escape into the blood. The entrapped limb may also act like a sponge, soaking up precious blood, causing sudden shock. This "crush syndrome" is well-recognized, and can be prevented. However, in disasters, many rescuers are not medically trained, and don't know to prepare the person properly for release, so deaths still occur.

The stress of release from entrapment may also contribute to renal failure (kidney failure). Renal failure can occur even if the person is still producing urine. Renal failure causes death over the course of several days, as waste products build up in the blood. The effects of renal failure may be staved off by using artificial kidneys (dialysis[1]), and this may be enough to allow the kidneys to recover on their own. Emergency dialysis can only be performed with specialized equipment and specially trained personnel in major medical facilities.

The "evil humours" released from damaged muscle includes **myoglobin**. Myoglobin is an O_2-carrying molecule found in muscles. It is similar to the hemoglobin molecule found in red blood cells. When released in large amounts after a crush injury, myoglobin is toxic to the kidney. When the urine becomes concentrated, myoglobin clogs tiny tubules in the kidney, effectively killing the kidney. You can detect myoglobin in the urine because it turns tea-colored or brown; even in the Emergency Department, looking at the color of the urine is the most important way to detect this problem.

Regardless of whether you can look for it or not, you should expect myoglobin in the urine and treat with **hydration**. Adding some sodium bicarbonate to IV solutions or to oral fluids you're giving (see below) may help dissolve the myoglobin, too.

Another of the "evil humours" released from damaged muscle is potassium. Fluid inside cells is unlike blood and other body fluids, in that cells contain lots of potassium. The blood potassium is normally regulated at a very low level. The normal blood potassium is 3-5 mEq/100cc compared with 140 mEq/100cc of sodium ("millequivalents per 1/10 liter"; just note the difference). High levels may cause irregular heartbeats, shock, and death. For this reason, you'd like to

avoid giving people IV or oral fluids with potassium. For IV fluids, NS (normal saline=water+table salt) is better than LR (Lactated Ringers=water+lots of different salts including potassium). However, if you have Gatoradei, which contains small amounts of potassium, but no salty fluids without potassium, give the Gatoradei. The benefit of the salt in the Gatoradei outweighs the danger of its small concentration of potassium.

Release of potassium may be delayed if a limb is trapped under a heavy weight and the blood supply is squeezed shut. The potassium may not reach the heart until you lift the rock, at which there may be a massive surge of potassium into the blood, causing the heart to stop. If you can, hydrate before and after removing the rock or rubble. A healthy adult can tolerate 2 liters of normal saline given IV over a few minutes without any signs of fluid overload. Cavers who are dehydrated can probably tolerate more. For those interested in more details of crush syndrome, there are several good articles that your local librarian can probably locate for you.[0,1,2,3,4,5]

Oral Fluids and Ileus

You can help prevent crush syndrome, shock, and renal failure by preventing dehydration. If a caver is already dehydrated from long entrapment, **rehydrate** before you release the person! Intravenous fluids are ideal but you won't always have them, so consider oral fluids.

Injured cavers can use the oral route for medication, food, and water, but only under certain conditions.

First, the intestines must be working. If the caver has an ileus (see below), nothing you give by mouth will be absorbed. What is worse, it will sit in the caver's stomach until the caver vomits it back up. At the best this is unpleasant for everyone, and at the worst, the caver aspirates (gets vomit in the lungs) and dies.

Second, the caver must be alert enough to be able to eat or drink without aspirating. Medical people often say "the patient must have an intact gag reflex." But, about 30% of normals don't gag, ever, and these people don't spend their life aspirating everything they eat or drink. We just want someone alert enough to have an intact swallowing mechanism.

Third, don't give oral fluids to someone who is going to go to the operating room in the next couple of hours. This would include abdominal injuries, or severe abdominal pain. Why? Because of the possibility of aspiration as the caver is being put under anaesthesia. If you're more than an hour from the hospital, however, you can give fluids up until just before the caver is likely to reach the hospital.

If you're going to start your caver on oral fluids, start with small sips of clear fluids. Don't let the caver take large amounts, no matter how thirsty. If the small sips stay down, then gradually give larger amounts.

After any trauma, it is common for the intestines to go "on strike." When a person has an ileus (the most common grammatical way to use the term), the contents of the stomach and intestines stay where they are, rather than moving gradually from the beginning to the end, as is the usual case. The coordinated peristaltic movements of the guts stop, or are replaced by ineffective spasms.

You cannot give a caver with an ileus fluids. If you give something to eat or drink, it will sit in the caver's stomach until he or she vomits.

Clues to a caver with an ileus include:

- the caver is not hungry;
- bowel sounds are absent or markedly decreased; and
- the caver is not having bowel movements and is not passing gas per rectum (farted).

Several types of oral electrolyte fluids are available.

Salt Tablets

Don't use salt tablets. Although you can give them with large amounts of water, the dissolving tablet may cause severe irritation of the stomach lining or even cause an ulcer. When using salt tablets and water, it is hard to balance the water/salt proportion properly, and giving too many salt tablets and not enough water may even cause seizures, especially in children.

"Athletic" Drinks

Gatoradei, Squincheri, ERGi, or similar "athletic" or "sports" drinks all contain a dilute (more dilute than blood) solution of sodium and potassium (sometimes with other salts) and varying amounts of sugar and flavoring. The advantage of these drinks over salty lemonade for when you're hot and sweaty is that they provide the potassium. Potassium is lacking in table salt, and is lost in sweat. However, one of the "evil humours" that is released from crushed tissue is potassium, so athletic drinks are **not** ideal for those with crush syndrome.

Cool dilute salt solutions with a small bit of sugar are more easily and quickly absorbed than other drinks. These drinks contain 50-90 mEq^2 per $liter^3$ of sodium, and for rehydration during strenuous exercise, are tolerated and absorbed better if diluted half-and-half with plain water. For rehydration from vomiting and diarrhea, use these drinks full-strength.

Concentrated Solutions

World Health Organization (WHO) solution is available in powder form, knows as ORS (Oral Rehydration Salts). This is an oral electrolyte replacement solution that has saved thousands from dying from the severe diarrhea of cholera. It contains 90 mEq of sodium, 20 mEq of potassium, 80 mEq of chloride, 30 mEq of bicarbonate (now being replaced with trisodium citrate), and 111 mmol (2%) of glucose.

Along with the old Red Cross "shock solution" (salt and sodium bicarbonate), ORS contains more salt and less sugar than the "sports" drinks, and were invented to deal with severe loss of fluids and electrolytes such as from severe diarrhea (e.g., cholera) and from blood loss. They taste terrible, because of the high salt concentration, but can be useful in these situations. They are probably inferior to Gatoradei and its competitors when you have lost more fluid than electrolytes (i.e., in most hot weather situations).

Salty Lemonade

To a liter (quart) of water and drink mix (lemonade seems to taste best with salt), mix in about half a teaspoon of salt. This makes a cheap and effective, if slightly unusual-tasting, fluid and salt replacement drink. This provides about 30 mEq of sodium per liter. This is a good fluid for when you're hot and sweaty, but to make it better for a person with crush entrapment, use a whole teaspoon of salt. This makes the solution about 60 mEq/L of salt. Packages of salt from fast-food restaurants are handy to keep in your cave pack for this purpose; each one has about a teaspoon.

Make Your Own

The old Red Cross "shock solution" is probably best for someone with crush syndrome. It doesn't have any potassium, which you should avoid, and includes some sodium bicarbonate (baking soda), which helps offset the acid in the blood from the crush injury. The recipe is a teaspoon of salt and a half teaspoon of baking soda per quart.

Crevice Entrapment

It is possible for a caver to be entrapped with minimal or no crushing. An example is caver stuck in crawlway, or who has slid down into a "keyhole" crevice (see Figure). Despite the dangers associated with crush injury, simple entrapment is still deadly. Several North American cavers have died from simple entrapment in the past decade. Some died of hypothermia, but even with autopsy results it's not clear why the others died.

Men and women tend to become entrapped differently, because of differences in bony anatomy. Women generally have larger hips than men; this is an advantage in child-bearing. It is also an advantage for entrapment in a crevice. Men, instead of getting wedged in by their hips as do women, instead get their chest wedged in. This means that men tend to have more trouble breathing than do women; this can lead both to poor oxygenation and to panic that leads to increased O_2 demand. The urgency of rescue efforts for a simple entrapment should always be high, but even higher for men than for women.

Simple entrapment is often complicated by other factors:

- lack of access: you may not even be able to take vital signs, or to start IVs, or even to give oral fluids;
- hypothermia -- from conduction due to large contact area with rock;
- dehydration -- from lack of access to fluids;
- blood clots in the legs (deep venous thrombosis) or lungs (pulmonary embolism) from immobilization; and
- psychological problems: panic and claustrophobia

Medical treatment for simple entrapment depends on the exact situation, but the following principles generally apply:

- Provide warmth.
- Provide food and water, and IV or oral fluids if possible.
- To prevent deep venous thrombosis and pulmonary embolism (blood clots in the legs and lungs):
  - encourage the caver to move his or her legs on a regular basis to prevent clots;
  - consider giving a half tablet of aspirin, because it will act as a mild blood thinner and may help prevent deep venous thrombosis (but don't do this if the caver has belly injuries, a significant head injury, major broken bones, or big bleeding cuts, as it might increase bleeding); and
  - consider trying to get a doctor involved (or in Eastern Region of the National Cave Rescue Commission, NCRC medics) to give dextran or subcutaneous heparin (blood thinners), as long as the caver has had no traumatic injury that might start bleeding again. Both dextran and heparin help prevent deep venous thrombosis.
  - Consider sedation, especially if the person shows signs of anxiety. A dose of haloperidol, or of the over-the-counter antihistamine Benadryl), while known to predispose slightly to hypothermia, might be appropriate as long as you are providing adequate amounts of heat to the caver.

Conclusion

So, being crushed or even just entrapped is bad. But you, having read this article, can now do a lot to save people who are trapped. You even have some information you can pass to paramedics who come in the cave to take care of the patient.

If you'd like to learn more about medical care of cave rescue patients, I suggest you take an EMT course and then take the Wilderness EMS Institute's Wilderness EMT course. It deals specifically with these and other cave rescue medical problems, and was developed from the start by cave rescuers. This course is offered on two weekends each November and March in western Pennsylvania, and at the Eastern Region NCRC weeklong class in West Virginia each summer.

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[1]**Dialysis:** the diffusion of solute molecules through a semipermeable membrane, passing from the side of higher concentration to that of the lower; a method sometimes used, in patients with defective renal function, to remove from the blood elements that are normally in the urine.

[2]**mEq:** Millequivalent. A measure of concentration for ions. For single-valence ions such as sodium, it is the same as millimole. For divalent ions such as chloride, which carries two negative charges, it is twice the concentration in millimoles.

[3]For all practical purposes a liter and a quart are the same.

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WHY YOU DON'T WANT TO BE PART OF THE FOOD CHAIN
or
PROPER CARE & FEEDING OF PARASITES

by Franklin Hubbell, DO

Malaria, Schistosomiasis, Amebiasis, Trichomoniasis, Giardiasis - strange, slightly familiar names that strike fear into the heart of humankind. While these sound like the intro to a new TV thriller, they are actually just a few of the various "animals" that can survive and thrive in us at our expense. These "animals" or organisms are part of a larger family of pathological or disease-producing organisms commonly referred to as parasites.

Derived from the Greek word *parasitos*, a parasite is defined as "a plant or animal which lives upon or within another living organism at whose expense it obtains some advantage." In other words, a parasite is an organism that lives on or within another organism feeding upon that organism and utilizing some of its nutrients in order to survive and thrive. In depriving the host organism of vital nutrients, the parasite causes malnutrition and disease. In essence, when invaded by a parasite army, we as human beings become part of the food chain. Generally speaking, a sound bit of advice is, *"Don't become part of the food chain."*

There are many organisms that live upon us or within us in both parasitic and non-parasitic relationships. These relationships are referred to in general terms as symbiotic. The non-parasitic relationships fall into two categories: mutualism, when the relationship benefits both organisms as in the case of humans and certain bacteria in our intestinal tract. These bacteria get the benefit of the digested nutrients and we get the benefit of the vitamins they elaborate as a by-product of their metabolism. The other non-parasitic relationship, commensalism, describes the situation in which one organism benefits without detriment to the other. As mentioned earlier, parasitic relationships result in one organism benefitting while the other is harmed.

The entire spectrum of parasitic infestation includes infections caused by viruses, bacteria (which include chlamydia & spirochetes), mycoses (yeast & fungi), protozoa, & helminths (worms). This article will provide an overview of these families and will concentrate on the preventive aspect of parasitic infections. Future articles will focus on specific disease entities, such as giardia, malaria, and other diseases mentioned in this article.

Before the discussion of parasitic infestation continues, there are several important terms that need to be defined: host, reservoir, and vector. The host is the organism upon which the parasite feeds and at whose expense it benefits. The reservoir is the animal in nature in which the parasite resides, often without causing harm. The reservoir supports the population of the parasitic organism and is the point from which the parasitic infection is spread. The vector is the mode of transmission by which the parasite is spread from the reservoir to the host.

VIRAL INFECTIONS

Viruses are the smallest of all living creatures, consisting only of a genetic core of DNA or RNA and a protective viral coat or shell. They do not entirely conform to the definition of life because they cannot replicate without the assistance of another living organism. Viruses are very small obligatory intracellular parasites.

In order for a virus to survive, thrive, and reproduce, it has to gain access into a host and then into a specific type of cell or tissue within that host. Once inside the cell, it invades the nucleus and deposits its genetic material (DNA or RNA) within the genetic material of the host thus taking over the machinery that runs the cell. Having commandeered the genetic machinery, the viral gene then turns the native cell genes into virus-producing factories. The cell slowly fills with new viral prodigy until it literally explodes, sending forth more viruses to invade more cells.

Viruses are very specific to the type of tissue they will

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or can invade. Viruses that cause sore throats only invade the epithelia that line the throat; viruses that cause common colds invade the respiratory epithelia of the airways. Viruses can cause diarrhea, encephalitis, meningitis, hemorrhagic fevers, cancer, AIDS, and Ebola.

It is obviously impossible to discuss every known virus in this article; however it is feasible to discuss the common vectors by which these diseases are spread.

Because viruses are obligate intracellular parasites, they do not survive for long outside their host. In fact, in order to survive at all, they have to remain moist. Therefore, the modes of transmission for viral infections are moist routes such as:

1. AIRBORNE or DROPLET -- when saliva or mucous produced by sneezing or coughing is inhaled directly or passed hand-to-hand by a hand shake or by touching a contaminated surface

2. WATER CONTAMINATION -- (commonly known as the fecal-oral route) when infected feces get into the water supply and the contaminated water is ingested

3. BLOOD -- when infected blood is introduced either by direct contact, by direct injection from a blood-sucking insect, or by sexual transmission.

Protection and prevention of a viral illness requires controlling the means of transmission:

1. Avoid airborne contamination by covering the nose and mouth with a tissue or handkerchief when sneezing or coughing.

2. Wash hands regularly, particularly after urinating or defecating.

3. Prevent people who are ill from becoming involved in food preparation or clean-up.

4. Avoid direct contact with blood or other body fluids.

5. Protect yourself from insect bites by covering up and using insect repellents.

6. Practice safe sex; use a condom.

BACTERIAL INFECTIONS

Unlike viruses, bacteria are more complex single-celled animals. They do contain organelles for obtaining energy from their surroundings, and they do have the ability to replicate themselves by the process of binary fission or splitting.

The family of disease-producing bacteria can be divided into smaller groups according to specific features common to certain bacteria. These groups include: *Rickettsial infections, Chlamydia infections, Spirochetal infections, Enteric Bacterial infections, Bacterial meningitis, Sexually transmitted bacterial diseases, Gram-negative bacterial infections, and others such as Anthrax, Tetanus, Clostridium, and Diphtheria.*

As with viruses, bacteria also have the tendency to invade and affect specific tissues: for instance, Strep prefers to attack the soft tissues of the throat causing the infamous "Strep Throat". But, unlike viruses, the bacteria do not stay put. Given the opportunity, they can and will invade other tissues causing significant disease. Strep pharyngitis that goes untreated can gain access into the blood stream and consequently infect the valves of the heart (Rheumatic Fever), and the kidneys causing significant renal disease (Post Streptococcal Glomerular Nephritis).

Bacterial infections have a tendency to cause more significant symptoms as compared to viral infections. Bacteria that have invaded the body begin to elaborate waste products and these waste products evoke specific responses. Our immune system is capable of recognizing these waste products as a signal that we are developing a serious bacterial infection and mounts an appropriate response against it. This response is known as an inflammatory reaction and is designed to control and defeat the invading army. The body initially reacts by producing a fever. Bacteria reproduce every 26 minutes at a normal temperature of 98.6 degrees F. If the temperature is elevated to 102 degrees F, the bacteria will stop reproducing, thus making it easier for the body to defeat the invading army. At the same time, the blood vessels in the area of the infection dilate bringing more oxygen and white blood cells (neutrophils) into the area. The neutrophils will destroy the bacteria by devouring it. A significant collection of white blood cells (WBC) creates an accumulation of pus. As a result, the individual with a bacterial infection will quite often develop a fever greater than 102 degrees F, and at the site of the infection, there will be increasing redness, warmth, swelling, tenderness, and possibly pus or purulent material as seen with a Strep throat or a local infection in a wound.

As with viruses, it is impossible to thoroughly review all of the various disease-producing bacterial infections. However, the modes of transmission, and, therefore, prevention are essentially the same as those of viruses. One of the advantages that we have today is the ability to kill bacteria with antibiotics. Viruses are not sensitive to antibiotics; however, bacteria are. Once a specific organism is the suspected cause of an infection, the appropriate antibiotic can be started to help the body eradicate the infection-causing organism before it spreads and causes greater harm.

THE MYCOSES

Mycoses are diseases caused by fungi, one of the most common organisms on the Planet Earth. Mentioned in this article for the sake of completeness, mycoses do not belong to the animal family. Instead, these organisms are members of the vegetable family fitting into the overall scheme of things as the recyclers. They survive and thrive by aiding in the process of decomposing dead matter, allowing the return of basic materials to the earth to be used by other plants and animals as the building blocks of life.

There are several varieties of fungi that can be bothersome and even life-threatening to humans. The classifications superficial, cutaneous, subcutaneous, systemic, and opportunistic refer to the area of the body they invade and set up residence.

The superficial mycoses affect only the dead, heavily keratinized outermost portions of the skin. Living tissue is not invaded, and the infections are of cosmetic concern only, such as *Pityriasis versicolor.*

Also colonizing only the outer keratinized layers of the skin, however, the cutaneous mycoses have a tendency to illicit a greater inflammatory response with more significant discomfort, disfigurement, and risk of secondary infection. They themselves however, are not life-threatening and consist primarily of the *tinea* family.

The subcutaneous mycoses are introduced into the body through a wound such as a puncture. Once inside the body, they produce a very significant inflammatory response which tends to extend with little healing. These *mycetoma* infections can be very serious.

The systemic mycoses primarily infect the lungs via inhaled spores. Diseases like *Histoplasmosis* can be very debilitating but are usually self-limiting.

The opportunistic mycoses cannot invade and infect a normally healthy person. Instead they seize the opportunity to infect a host already immune-compromised by other diseases like AIDS, leukemia, diabetes, or malnutrition.

PROTOZOAL INFECTIONS

These next two families of organisms, protozoa and helminths, do not stalk their prey. Rather, they wait patiently until the right opportunity and then ambush their prospective host. In order for them to parasitize us, the hosts, they have to get inside us via the oral route(in food or water), by being injected through our skin by an insect, or by worming their way through our skin after direct contact.

Protozoa, usually unicellular animals, are some of the simplest organisms in the animal kingdom. They are divided into four classifications, or phyla, based upon their means of locomotion: Sarcodina (amoeba), Mastigophora (flagellates), Ciliophora (ciliates), and Sporozoa.

The Sarcodina move by projecting a pseudopod and flowing or pulling themselves along. Amoebae that infect and cause serious illness in humans are *Entamoeba histolytic* and *Naegleria fowleri.* Both are transmitted by contaminated water or food and can exist in either a protective cyst form or a mobile trophozoite form.

The Mastigophora utilize the whiplike motion of their flagella to propel them. Flagellates that infect humans and cause serious illness are *Giardia lamblia, Trypanosoma brucei gambiense, Trypanosoma brucei rhodesiense, Trypanosoma cruzi,* the *Leishmania* species, and *Trichomonas vaginalis,* a sexually transmitted disease. These protozoa can be transmitted by contaminated food and water (as with giardia), and by various biting insect vectors.

The Ciliophora get their movement by cilia or short hairlike projections from their surface. The ciliated protozoa that infects humans is *Balantidium coli,* an intestinal parasite transmitted by contaminated food and water.

The Sporozoa are pathogenic (disease-producing) parasites that have no means of locomotion. They include the *Plasmodium* species that produce Malaria, *Toxoplasma gondii,* and the *Isospora, Cryptosporidium,* and *Sarcocystis* species. These protozoa are primarily transmitted by insect vectors that bite humans for a blood meal. Cryptosporidium is an intestinal parasite that is transmitted by contaminated water and is a common cause of diarrhea.

HELMINTHIC INFECTIONS

Helmins in Greek means worm, and the parasitic worms or Helminths are large multicellular organisms with complex tissues and organs which are classified in three groups: Annelids, Nematodes, and Platyhelminths.

Annelids are segmented worms of which only the leeches are of any medical importance. Although they do not spread disease, the wound that they create to draw blood can become secondarily infected, especially in the tropics.

Of the more than 80,000 parasitic species of Nematodes, non-segmented complex roundworms, most are free-living in soil and water and have a single specific host. The nematodes that infest humans can be divided into three groups depending upon where they reside: the gut, the blood, lymphatics, subcutaneous tissue, or other tissues.

The gut invaders and residents (i.e. the alimentary canal) include:
Ascaris lumbricoides, Ancylostoma duodenale, Necator americanus, Trichuris trichuria, Enterobius vermicularis, Strongyloides stercoralis, Capillaria philippinensis, and *Trichostrongylus orientalis.*

In the circulatory system, the lymphatics, and the subcutaneous tissues nematodes include: *Wucheria bancrofti, Brugia malayi, Brugia timori, Loa oas, Onchocera volvulus, Mansonella ozzardi, Mansonella streptocerca,* and *Dracunculus medinensis.*

Nematodes that invade other tissues are usually nonhuman parasites that have mistakenly found their way into humans. Following the migration pattern as if they were in their usual host, the nematodes invade unusual places. The only human parasite is *Trichinella spiralis* which invades muscle tissue.

The flatworms Platyhelminthes include both trematodes, the flukes, and cestodes, the tapeworms.

Trematodes live in various parts of the body. *Schistosoma* reside in the venous side of the circulatory system; *Fasciolopsis, Echinostoma, Heterophyes, Gastrodiscoides,* and *Metagonimus* are all interred in the intestines; *Clonorchis, Opisthorchis, Fasciola,* and *Dicrocoelium* lie in the biliary system of the liver; and *Paragonimus* lounges in the bronchial tree of the lungs.

As adults Cestodes or tapeworms live in the intestines, but in larval stages may reside in a variety of tissues. Human tapeworms include: *Diphyllobothrium latum* and *pacificum, Taenia saginata* and *solium, Hymenolepis nana* and *diminuta,* and *Dipylidium caninum.*

Transmission of the helminths can occur by the oral route i.e. helminth eggs contaminating food and water; by skin penetration in the larval stages, and by diet of an insect vector.

THE PRINCIPLES OF PREVENTION

In order to develop a parasitic infection, the parasite has to be introduced into the body. Prevention of infection is primarily accomplished by interrupting the vector or the mode of transmission of the disease. Prevention is the most important point in parasitology not only because diagnosis can be extremely difficult and many of the treatments are very toxic with many side effects, but especially because many of the infections are simply not treatable and are fatal.

THE DO'S AND DON'TS OF PREVENTION

FOOD & WATER:

1. Never drink water that may be contaminated - or - always disinfect you water.
2. Never drink beverages with ice cubes in them if the water quality is questionable..
3. Never assume that alcoholic beverages are parasite-free.
4. Never eat raw or undercooked meat, fish, poultry.
5. Never eat cooked food that has been lying around unrefrigerated.
6. Never eat raw or undercooked vegetables that cannot be peeled.

CLOTHING & INSECTS:

1. Wear protective clothing.
2. Use insect repellents.
3. Always sleep under mosquito netting in the tropics.
4. Never go barefoot - always wear shoes.
5. Never swim in suspect water.
6. Always check for ticks in endemic areas.

VACCINES, PROPHYLACTIC DRUGS, & OTHER:

1. Get proper vaccinations.
2. Use prophylactic medications.
3. Practice safe sex.

FOOD & WATER

Contaminated water is one of the most common means of transmission of viral, bacterial, protozoal, and helminthic infestations. Water supports life, so when water becomes contaminated with infected feces or other material, parasitic life can survive until the water is decontaminated by chemicals, filtering, or boiling.

Disinfecting water with chemicals has recently become controversial with regard to how effective chlorination or iodination is against the cyst form of such parasitic infections as giardia or cryptosporidium. Filtering can be effective if used properly. Bringing water to a rolling boil kills all-- there is not a single bug or beasty from the Planet Earth that can survive 212 degree Fahrenheit water.

Freezing will kill most organisms, but not all. Certain parasites can go into a cyst form and survive for months in ice. Alcohol is another myth - again most organisms do not survive the tequila in a margarita; however, some can and will. To be safe, drink only disinfected or pasteurized bottled water or beverages, and, when in doubt, disinfect it yourself with chemicals, filtering, or boiling. So.....

1. BEWARE OF THE WATER...Never drink water that may be contaminated.
2. BEWARE OF ICE CUBES...Never drink beverages that contain ice cubes.
3. BEWARE OF ALCOHOLIC BEVERAGES...Never assume that alcoholic beverages are pure.

Food is also a common source of parasitic infestation. Just like water, food is probably moist and contains nutrients on which certain organisms can live. The food may also already be contaminated with a parasite that, once eaten, will infest the new host. Raw food is dangerous because it can contain live parasites or the eggs or larva waiting to infect a new host.

Vegetables do not contain any parasites harmful to man; however, in the folds of the rinds, between the leaves, or in the soil in which the plant grew can be the parasites. By either cooking, peeling, or properly cleaning, vegetables can be made parasite-free. Meat can also harbor living parasites, eggs, or larva and should be properly prepared before eating. Once meat is cooked, it should be eaten hot or else refrigerated to avoid harmful bacteria from growing. So....

4. BEWARE OF RAW OR UNDERCOOKED FOOD...Never eat raw or undercooked meat, fish, poultry, iguana, or other local delicacy.
5. BEWARE OF UNREFRIGERATED COOKED FOOD...Never eat cooked food that has been lying around unrefrigerated.
6. BEWARE OF RAW FRUITS AND VEGGIES...Never eat raw fruits and vegetables that cannot be peeled. Never eat lettuce, as it cannot be properly cleaned.

CLOTHING & INSECTS:

Many of the more serious parasitic infections are spread by blood-sucking insect vectors. For example, Anopheles mosquitos spread malaria , the most common disease and cause of death in the world; Redivids or kissing bugs spread

Chaga's disease or American Trypanosomiasis, a deadly parasitic disease common in Central America; and black flies can spread Onchocerciasis or river blindness, the most common form of blindness in the world.

The prevention of disease transmission from the reservoir to the host by an insect vector calls for the elimination of either the reservoir, the host, or the vector. The easiest one to manage is the vector. By wearing proper clothing, using insect repellents(either DEET-containing compounds or permethrin- containing compounds), and sleeping under mosquito netting to avoid being bitten at night (when most bugs come out and hosts are least aware of their presence), the life cycle of the parasite can be interrupted and the infection avoided. So...

1. WEAR PROTECTIVE CLOTHING
2. USE INSECT REPELLENTS
3. ALWAYS SLEEP UNDER MOSQUITO NETTING IN AREAS OF DISEASE

Other vectors include ticks and fleas, urine and feces deposited on the ground by infected animals, and swimming in contaminated water.

Ticks can spread Lyme disease and Rocky Mountain Spotted Fever; fleas can spread Leishmaniasis and the plague. If barefoot, you step in the urine or feces deposited on the ground by infected animals, a parasite can burrow through the skin on the bottom or the foot and then migrate through the tissue into the gut, as in the case of hookworm.

Water can contain free-swimming parasites like giardia which can be ingested by swallowing or like swimmer's itch-producing Schistosomiasis which can migrate directly. So...

4. NEVER GO BAREFOOT...Always wear shoes not sandals.
5. NEVER SWIM IN SUSPECT WATER.
6. ALWAYS DO TICK CHECKS IN AREAS OF TICKS AND DISEASE every 3-4 hours to remove any embedded ticks before they can spread disease.

VACCINES, PROPHYLACTIC DRUGS, and OTHER:

When traveling to distant lands, it is important to find out what diseases are endemic to the area. Many of these diseases (Tetanus, Diphtheria, Mumps, Measles, Rubella, Polio, Yellow Fever, Rabies, Hepatitis A and B, and others) can be prevented by proper immunization with vaccines. Malaria can be prevented by taking a daily or weekly prophylactic medication.

Other diseases, found in both near and distant lands, can be contracted through human contact, especially the sexually transmitted diseases (STD's), transmitted by vaginal and rectal intercourse. These diseases include: Chlamydia, Gonorrhea, Syphilis, Herpes, HIV, Chancroid, and Granuloma Inguinale. All of these STD's can be avoided by practicing SAFE SEX. So...

1. GET THE PROPER VACCINATIONS.
2. USE ANTIMALARIAL PROPHYLACTIC MEDICATIONS.
3. PRACTICE SAFE SEX.

LIVE AND LET LIVER: HEPATITIS A

by Buck Tilton

Hepatitis A virus (HAV) gets into your body primarily through the fecal-oral route, and that means the germs were in the fecal matter of someone who had the virus, and somehow the virus got into your mouth, and you swallowed. You can get the virus from drinking contaminated water and, sometimes, from eating raw or undercooked foods, especially clams and shellfish. But most people get it from eating food prepared by contaminated (read *unwashed*) hands, and, reports the World Health Organization, most cases in United States citizens occur among those visiting middle to upper class tourist destinations. "Hepatitis A is a serious health risk for all Americans traveling to endemic regions," says Elaine C. Jong, M.D., co-director of the Travel Medicine Service at the University of Washington medical Center, "even if they stay in a resort or five-star hotel." Although the virus appears around the world, it is significantly more common in underdeveloped nations. Hepatitis A shows up 100 times more often than typhoid and 1,000 times more often than cholera, affecting approximately 10 million people worldwide every year. As far as the U.S. is concerned, experts disagree, claiming anywhere from 31,000 to 143,000 Americans will suffer from Hep A this year.

HAV shares a family name with other viruses, picornavirus, a single strand of RNA of infinitesimal smallness. Sixteen thousand HAVs could reside on the head of a pin. Like all viruses, they cannot replicate outside a cell. They break through cell walls and take over the biological machinery in order to reproduce themselves. To rid your body of a virus, your immunological defenses must wipe out the infected cells.

HAV has a great affinity for your liver. Hepatitis is, indeed, a liver inflammation. The invading virus establishes itself within the strong fortifications of your liver's cells. Your immune system rallies its forces and attacks, eventually destroying the invader, but blasting your liver at the same time. The incubation period, the time from swallowing to sickness, varies from two to seven weeks. One of the first symptoms is a loss of appetite. When you start feeling sick, you'll sure enough think you've been in a battle: aching joints and muscles, fatigue, headache, sore throat, nausea and vomiting, fever and swollen lymph nodes. Your abdominal region may hurt, particularly your right side where your liver lives. Don't be surprised if your skin and the whites of your eyes turn yellow, a condition called jaundice. Jaundice results from your war-torn liver's temporary inability to remove all your body's

waste products.

You might think you've got the worst "flu" imaginable, but it usually takes three to five weeks in the average patient for all the symptoms to resolve, and most people have visited a doctor by then. Only lab tests involving your stool or blood reveal if you truly have hepatitis A.

There will be no power pill given you to knock out the virus. None exists. The disease must run its course and, as the battle rages, there's nothing you can do except support your body's fight. You'll need plenty of rest, and you'll want it since your liver helps provide energy and is busy with other problems. Drink a lot of water. Avoid alcohol and medications. All drugs pass through your liver, and taking something to feel better could make you worse.

After a few days you'll start to think you're OK, but the war continues. Until you are completely well, you can easily pass the virus to other people so don't share food, or cups or glasses, or utensils. Don't share physical love. And don't forget to wash your hands after you visit the bathroom.

Children tend to bounce back faster than adults, but, despite a period of thinking otherwise, you should plan on plenty of time for a full recovery. Only in rare cases does hepatitis A turn serious. The human liver, unlike other organs, possesses a remarkable ability to rebuild destroyed cells.

Viral cousins of hep A, which include hepatitis B, C and D, are far less kind to your body. These diseases are not passed via the fecal-oral route, but are transmitted by contact with blood and other body fluids.

During the struggle for your liver, your body produces specific antibodies, the specialized attack-and-destroy soldiers sent against the virus. Once the antibodies have been produced, it is extremely unlikely that you will get sick with hepatitis A again for the rest of your life, a little reward for weeks, perhaps months, of debilitating illness.

But why bother? You don't have to get sick. Immune globulin, also known as gamma globulin, has been available for years. Made from human plasma, gamma globulin, injected into your body supplies you with a single dose of antibodies that prevent the disease from flaring up if you contact hep A. The antibodies usually last for three to six months. If you get the shot within seven days after contracting the virus, gamma globulin should still prevent the illness. Within 14 days, and you should have a much less severe case. Unfortunately, the demand for gamma globulin far exceeds the supply, and ;you may find it impossible to get the shot before your next journey abroad.

News from the prevention front, on the other well-washed hand, is good. The FDA recently granted SmithKline Beecham Biologicals approval of the first vaccination that keeps you from getting sick with hepatitis A. Instead of injecting antibodies into you, the way gamma globulin works, the vaccination causes your body to produce its own antibodies. Fifteen days after an injection of Harvix R, you are ready to destroy all invading HAV before it has a chance to ruin the next few weeks to months. A booster dose is recommended six to twelve months after the initial shot, after which you may never have to worry about hepatitis A again. The injection must be administered at your doctor's office.

Harvix R does not eliminate the need for thoughtful living while you're visiting less developed countries. You should still be eating food that has been well cooked or fruits that have an intact peel prior to your peeling of it. Your drinking water should be disinfected, and you should avoid ice in your drinks unless the water for ice was disinfected before freezing. When you brush your teeth, that water, too, should be disinfected. Water can be easily disinfected, worldwide, by bringing it to the boiling point or by filtering it through a water filter that removes all protozoa and bacteria and kills all viruses. Water filters with the government stamp of approval for removal of all pathogens (disease-causing organisms) are the Explorer and Scout from PUR, Minneapolis, MN, and the Guardian with its ViralGuard cartridge from SweetWater, Longmont, Co.

But the shot is worth the money. All U.S. travelers visiting Mexico, parts of the Caribbean and other hepatitis A endemic regions, says Dr. Jong, "should now be vaccinated to prolong protection against the disease."

Note: To help you make decisions about vaccinations, the Centers for Disease Control (CDC), Atlanta, GA, maintains a 24-hour International Traveler's Hotline; (404) 332-4559.

WHO'S WHO IN WILDERNESS MEDICINE: AN INTERVIEW WITH WARREN D. BOWMAN, JR., MD

by Buck Tilton

"I have been interested in the outdoors since WWII when I was a Boy Scout and used to spend my Christmas vacations hiking the Appalachian Trail in Virginia, " says Dr. Bowman. His wilderness experiences were interrupted by college and the intense demands of medical school. Dr. Bowman handled the demands well, graduating from the University of Pennsylvania School of Medicine in 1954 with the Lowenberg Prize in Pediatrics and the Albert Einstein Medical Center Prize awarded to the highest four-year scholastic record. After two years with the Indian Health Service and residency, he ended up in Montana where the problems of delivering health care in isolated geographic areas fired his interest. An avid skier and mountaineer (with winter ascents in Alaska and the Tetons and numerous summer climbs), Dr. Bowman joined the National Ski Patrol in 1964 and became the NSP's National Medical Advisor in 1970. "One of my intentions, " says Dr. Bowman, "was to provide direction for the ski mountaineering/off-area rescue and Nordic people in providing "backcountry first aid," which is what we used to call wilderness prehospital care."

Dr. Bowman has contributed numerous times to prestigious medical publications including sections on "Cold Injury" in Conn's *Current Therapy* (1982) and Edlich & Spyker's *Current Emergency Therapy* (1984, 1985), and chapters on "Cold Weather Survival" in the three editions of *Management of Wilderness and Environmental Emergencies.*

A brilliant and gentle man, big of heart and soul, Dr. Bowman has few peers among those talented men who have given freely of their time and talents to further wilderness medicine. In addition to being past chairman of the National Association of Search and Rescue's (NASAR) medical committee, he currently serves as President of the Wilderness Medical Society.

WMN: Dr. Bowman, what do you consider your most significant contribution to wilderness medicine?

DR. BOWMAN: I believe my most significant contribution was being one of the architects of the NSP's Winter Emergency Care course, which included writing its textbook, *Outdoor Emergency Care*. Our intentions were to produce a course that not only would train ski patrollers but that would be an entry-level emergency care course with an emphasis on non-urban care problems suitable for training wilderness guides, mountain rescue, and backcountry SAR personnel, etc.

WMN: What do you consider a major problem for outdoor programs and wilderness-oriented organizations, and what guidelines do you offer?

DR. BOWMAN: Every year we see horror stories of completely unnecessary tragedies in the winter wilderness, i.e., the Aspen cross-country skiers who made just about every mistake they could have made three winters ago. I feel strongly that persons who chose to enter the winter wilderness for recreational purposes need to be familiar with the principles of heat production and conservation, proper fabrics and items of clothing, the ability to build a fire in inclement weather, the ability to use snow as insulation when building a shelter, and the training to know when conditions are so severe that they need to stop and dig in. Such persons must be educated to always carry emergency equipment, even on excursions of only a few hours.

WMN: Are you willing to have our readers write to you with their questions?

DR. BOWMAN: Yes. I will be moving to Cook City, MT, soon, but my mail will be forwarded from 2312 Pine Street, Billings, MT 59101.

CONFERENCE UPDATE

Colby College's **Wilderness Medicine Conference** will be held July 16-20 in Waterville, Maine. Write Colby College for more information: Special Programs, Colby College, 4720 Mayflower Hill, Waterville, ME 04901-4720.

The Wilderness Medical Society's **Second World Congress on Wilderness Medicine** will take place August 8-12, 1995 in Aspen, Colorado. Call or write WMS for information: WMS, PO Box 2463, Indianapolis, IN 46206-2463; (317) 631-1745.

The National Outdoor Leadership School and Outward Bound USA co-sponsored **1995 Wilderness Risk Managers Conference** will be held October 12-14, 1995 in Estes Park, Colorado. Call or write John Gookin for information: NOLS, 288 Main Street, Lander, WY 82520-3128; (307) 332-6973.

The Wilderness Medical Society's **Desert Medicine Conference** will take place October 11-14, 1995 in Tucson, Arizona. Call or write WMS for details: WMS, PO Box 2463, Indianapolis, IN 46206-2463; (317) 631-1745.

The American Camping Association's **1995 Risk Management Forum** will be held November 1-4, 1995 in Tarpon Springs, Florida. Fax or write the ACA for more information: ACA, Inc., 5000 State Road 67 North, Martinsville, IN 46151-7902; (317) 342-2065 (fax).

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Oct. 23 - Nov. 3 AMC, NH (603-466-2727)
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Wilderness First Aid/WFR Recertification
Sept. 8-10 Hulbert, VT (802-333-3405)
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Wilderness First Aid/WFR Recertification
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Oct. 16-17 San Juan Island, WA
Nov. 17-18 Davis, CA
Jan. 27-28 Albuquerque, NM

Wilderness EMT Refresher
Nov. 9-14 Pitkin, CO

The *Wilderness Medicine Newsletter* is intended as an informational resource only. Neither the *WMN* or its staff can be held liable for the practical application of any of the ideas found herein. The staff encourages all readers to acquire as much certified training as possible and to consult their physicians for medical advice on personal health matters.

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

JULY/AUGUST 1995 ISSN-1059-6518 VOLUME 6, NUMBER 4

PEDIATRIC ADVENTURES—MORE ON WHEN A CHILD RUNS WILD

by Franklin Hubbell, DO

The March/April 1994 issue of WMN was dedicated to pediatric emergencies in the wilderness environment. This issue will continue to expand on these topics.

SUMMARY OF THE MARCH/APRIL 1994 ISSUE — WILDERNESS PEDIATRICS

THE BASICS:

1. Children are poor historians. You may have to rely on the parents or whoever was with the child for a complete history.
2. If at all possible, never separate the child from the people they trust.
3. Be observant. The way a child behaves will tell you a great deal about their medical status and severity of injury.
4. Perform the patient exam from toe-to-head, not head-to-toe.
5. Gain their trust and examine the parts that hurt last.
6. Use instruments, such as BP cuffs and stethoscopes last, to minimize fear.
7. Talk to them, tell them what you are doing, reassure them that they will be OK.
8. Vitals signs are different. The smaller the animal/child, the faster the heart beat, and the faster their respiratory rate.
9. Always assess children for dehydration: Look at the mucous membranes; are they moist? Are the children crying? Have they urinated recently?

CHILDREN & FEVER:

1. A temperature higher than 101F that is sustained for more than 24 hours needs to be treated and evacuated.
2. Tylenol (acetaminophen) may be used to reduce the fever, **NEVER USE ASPIRIN IN CHILDREN.**

CHILDREN & HEAT:

1. Water, water, water — you can't drink too much water. Children are more sensitive to heat injuries, heat stroke, and heat exhaustion than adults. Keep them well-hydrated and do not rely upon thirst as an indicator of dehydration. A well-hydrated child will urinate every 2 - 3 hours, and the urine should be light yellow to clear. If it is dark, they are dehydrated.
2. Do not overdress them. Use loose woven fabrics and loose clothes, but keep them covered up to protect from sunburn. A HAT PREVENTS SUNBURN AND HEAT INJURY.
3. Do the hardest walking and hiking in the coolest part of the day.
4. Do not give the child antihistamines. Even over-the-counter antihistamines can increase the risk of heat injury by decreasing the effectiveness of the sweating mechanism.

Continued on page 2

A Word from the Editor...

With the focus of this issue on pediatrics, I thought it most appropriate to dedicate this edition of the newsletter to the most recent addition to the world of wilderness and emergency medicine...Zachary Gray Tilton, adorable son of writer and Wilderness Medicine Institute Executive Director, Buck Tilton and Wilderness Medicine Instructor and WMI Director Melissa "Bugg" Gray. I am already receiving reports that Zach is itching to sit down to a keyboard and start pecking away at articles for the newsletter. Congratulations to Buck and Bugg...and Zach, we hope you are ready to take over in a *few* years.

Holly

5. Watch overweight children closely, as they are better insulated and find it harder to get rid of the excess heat in their system.
6. Sweat must be able to evaporate to cool. If it is very humid, slow the pace or take a break and rest to allow the body to dissipate the excess heat load.
7. If a child becomes overheated, soak with water and fan to accelerate the rate of cooling. Hydrate well.

CHILDREN & DEHYDRATION:

1. Children dehydrate faster than adults and tolerate it less.
2. Signs of dehydration are dry mucous membranes, no tears, no urinating, or dark urine output. Dehydration may also present like flu with a headache, nausea, and fatigue.
3. If the dehydration is caused by diarrhea, treat with Oral Rehydration Salts (ORS).
4. You cannot give children too much fluid.

CHILDREN & SUNSHINE:

1. Sunburn will cause permanent damage to a child's skin and significantly increase the risk of skin cancers.
2. Cover them up with proper clothing. Have them wear a wide-brim hat, and use sunblocks that are properly applied frequently.
3. Protect their eyes with sunglasses to prevent cataracts.

CHILDREN & INSECTS:

1. Insects spread disease, their bites cause discomfort, and the scratched wounds have a tendency to get infected. So, prevention of insect bites is important. Wearing proper clothing, using insect repellents, and sleeping in a tent or under mosquito netting reduces the likelihood of unpleasant encounters with bugs.
2. DEET is not recommended because it is a proven neurotoxin that can potentially cause serious damage. There are other effective insect repellents including permethrin products that do not have the same risk. Always put repellants on the child's clothes, not on the child.

CHILDREN & POISONS:

1. KNOW THE ENEMIES and protect kids from them. Toxins that you carry- insect repellents, fuels for stoves, and medicines- can be harmful to children. Plants like poison ivy are contact poisons while other plants like berries and mushrooms that kids potentially eat can be very dangerous to little people.
2. Carry Activated Charcoal and know how to use it if you suspect an oral poisoning.
3. For contact poisons such as poison ivy, wash the skin and clothes well. Treat with hydrocortisone creams and oral antihistamines such as Benadryl.

CHILDREN & COLD:

1. Children cool off faster than adults, and their response to hypothermia is poor.
2. Have them wear proper clothes appropriate for the weather and KEEP THEM DRY, if they get wet, get them dry.
3. Treat the problem early before it becomes severe.
4. Never put a child to sleep if they are wet or damp or allow them to sleep in a damp sleeping bag.

CHILDREN & MEDICATIONS:

1. Medications for children should be in a liquid form or chewable. Medicines in a liquid form may require refrigeration.
2. Be very careful in dosing the medication. In children the dose is based on the child's body weight (usually in milligrams(mg) of medicine per kilogram(kg) of weight). Children do not tolerate overdosing of medicines.

CHILDREN & OUCHIES:

1. Properly clean wounds, even in the sobbing child.
2. Keep wounds clean and dry.
3. Use child- friendly bandages with cartoon characters, "hot" colors, etc.
4. Watch wounds very closely; some wounds can develop serious infections.

CHILDREN & DIAPERS:

1. Prevention of diaper rash may be aided by the use of super absorbent diapers and barrier creams such as Desitin.
2. If a diaper rash occurs, allow it to "air out," and use barrier creams whenever possible. Prescription creams such as Lotrisone may dramatically increase healing time.

OTHER COMMON PROBLEMS THAT DESERVE ATTENTION:

FEET, FOOTWEAR, & BLISTERS:

Foot problems are commonly encountered by adventurers. If you are going to be doing a lot of hiking it is very important to wear boots that support the ankle and fit well to prevent blisters and sprains.

Except for our ankles, our bodies are extremely well-designed. Standing erect on our hind legs puts unusual forces on our ankles. As a result they are susceptible to injury, particularly sprains. When the ankle is sprained, the ligaments supporting the ankle are pulled and injured resulting in a swollen painful ankle that is very difficult to walk on.

Prevention of sprained ankles can only be accomplished by proper footwear that supports the ankle. The single most important investment that a mountaineer can make is in the boots they wear. Kids are a particular problem in this area. Boots are expensive. and because kids tend to outgrow them almost every season, people are often reluctant to purchase good quality footwear. Proper fitting boots need to go above the ankle to provide good support, have a rigid sole to steady the foot on a rough bumpy trail, and fit well to prevent blisters. Do not get boots with "oil resistant" soles because they are very slippery when wet.

When purchasing boots, be prepared to have kids try on many pairs until you find ones that fit well. Once at home, the

child should wear the boots around the house evenings for at least a week to make sure they fit well and don't cause any sore spots. Finally, before going on a long trip, take a day hike to insure the boots perform well on the trail.

It is very tempting to let children hike in sneakers or low-cut shoes. If you do, however, you are simply courting a disaster that may very well result in an injury which, at the least, will ruin your trip, in the worst case scenario, cause significant permanent injury to the ankle.

BLISTERS: A little education goes a long way. Teach the child to stop and do something about a "hot spot" before it becomes a blister.

HOT SPOTS: Hot spots precede blisters. They are small painful areas on the foot where the boot is rubbing against the skin. If left untreated, these areas will result in a blister. Treating the hot spot early will prevent the blister from forming. At the first sign of discomfort, take the boot off and check the fit and the sock combination. Cover the hot spot with mole foam or athletic tape to give the boot something other than skin to rub against.

If a blister has occurred, treat it by: first, cleaning the area well with soap and water; then, using a sterile needle (flame it to kill the bugs on the needle), puncture the base of the blister in several places and push the fluid out of it. This tender spot now needs to be protected from further abuse and boot chafing. The best way to provide protection for the blister is to use moleskin. Take a piece of moleskin and cut a hole out of the center of it slightly larger that the blister itself. Trim the moleskin to anatomically fit the area of the foot creating an area around the blister that will protect it. The hole that the blister sits in should be filled with an antibiotic ointment, and the whole area covered with athletic tape.

Do not remove the moleskin as it will rip the skin off with it. However, do remove the tape daily and inspect the area. Leave the area open when not in boots. If this technique is used, the blister should heal in 2 - 3 days and allow the trip to continue during the healing process. The moleskin will wear off.

SKIN RASHES & SKIN INFECTIONS:

The skin, or integumentary system, is the largest organ in the human body. One of the skin's many important functions is to provide a bacterial/ viral/fungal-proof barrier to protect us from infection. There are millions of bugs living on our skin. As long as our skin is intact, these bugs are unable to invade and cause infections. However, if the integrity of the skin is broken by abrasion, incisions, blisters, burns, etc., this army of bugs can breach our first line of defense and cause a skin infection.

Minor wounds in the backcountry are very common: scratches from bushes, "itchy" insect bites that are scratched, chafed areas in the groin from clothes rubbing, sunburn, abrasions from rocks, etc.

The most common minor skin infections come in two varieties. Bacterial infections of the skin caused by Staph bacteria are labelled "impetigo"; fungal infections of the skin are commonly called ringworm.

Impetigo can be easily recognized. As the area of the wound, usually an abrasion, becomes red and a honey-colored exudate occurs, the area appears to weep. This particular infection responds very well to a prescription antibiotic ointment called Bactroban. I highly recommend that a tube of this should be carried in any first aid kit. To encourage healing and prevent infection, it can be safely used on any minor wound.

Fungus likes to grow in dark, moist, warm areas, so fungal infections commonly occur on the feet between the toes and in the folds of skin in the groin. . The skin will become red, and the redness will spread outward daily. The rash generally itches. These infections respond well to antifungal creams. There are several over-the-counter antifungal creams that work well, but the best are prescription. The two prescription antifungal creams that I recommend are either Nizoral cream or Lamisil cream. Both are very effective offering quick relief of symptoms. While very irritating, fungal infections are never serious are very easily treated.

ALLERGIES:

Minor environmental allergies to pollens and dust are very common. The symptoms of minor allergies can be a combination of a runny nose, itchy eyes, scratchy throat, minor cough, or itchy skin. These symptoms are rarely debilitating, but they can dramatically decrease the enjoyment of a trip for a child.

Allergies are easily treated with antihistamines, but the drawback to antihistamines is that they can decrease the child's ability to sweat making them more susceptible to dangerous heat injuries. Antihistamines also have the side-effects of drowsiness or, in some children, hyperactivity. The best recommendation is to use the antihistamine at bedtime when the risk of heat injury is low. Unless it causes hyperactivity, it will help to alleviate the symptoms and allow them to sleep well.

EAR INFECTIONS, SORE THROATS, & COUGHS:

These are common afflictions that children suffer from which may crop up on an outing. The primary concern is whether the infection can be safely field-treated or does the child need to be evacuated and seen by a doctor.

Most ear infections, sore throats, and coughs are caused by a virus as opposed to a bacteria. The difference is that a viral infection is usually less severe with a low grade temperature (<102F), minor discomfort, a dry non-productive cough, a mild sore throat without white spots. A bacterial infection, on the other hand, usually causes a high grade fever (>102F)with more severe symptoms-- a productive cough with colored sputum, possibly white patches in the throat. The illness does not improve quickly on its own..

Suspected viral infections can be field-treated with rest and hydration. There should be improvement within 3 days, and the child should be better within 5 days. However, if the temperature is sustained for greater than 24 hours, or if it goes above 102F, then give the child acetaminophen and take to a doctor for evaluation.

RULES TO LIVE BY - SEEK MEDICAL ATTENTION IF THE CHILD HAS:

1. A fever sustained for more than 24 hours or temperature greater than 102F. Give them acetaminophen (see Table for dosage) and evacuate.
2. Productive cough, of a colored sputum, especially if associated with a fever. Treat a productive cough with hydration - lots-o-fluids.
3. Severe ear pain or a draining ear.
4. Sore throat that has lasted more than 3 days, particularly if there are white patches in the throat.

DIARRHEA & CONSTIPATION:

Constipation is a very common problem not only because of dehydration but also because of the fear and anxieties of having to go to the bathroom in the woods. As we become dehydrated the body pulls more fluid out of the stool in the colon causing the stool to become dry and impacted. Children also tend to hold it in because of the anxiety of going to the bathroom in an unusual place. Constipation is prevented by good hydration and teaching children how to "shit in the woods" (a title of a very popular outdoor book). If a child becomes dehydrated give them 1 teaspoon of "Milk-of-Magnesia and several glasses of water. Rather than being absorbed in the body, the "M-O-M" stays in the bowel causing water to be drawn into the bowel thus softening the stool.

Diarrhea is also a problem commonly associated with adventure travel. Children have a very sensitive gut-- anything that disturbs its equilibrium will almost always result in diarrhea. To treat diarrhea, force fluids. As long at the child remains well-hydrated, they will recover within 24 hours. If the diarrhea lasts more that 24 hours, continue to force fluids but add in Oral Rehydration Salts and give them peptobismol tablets, 1 every 4 hours until the diarrhea slows. If the diarrhea continues for another 24 hours or if it is associated with a fever or blood in the stool then seek medical attention without delay.

ASTHMA:

A very common childhood problem is asthma, a condition where exposure to an inhaled allergen or trigger, will cause the breathing tubes, known as bronchioles, to constrict. As a result, the child will complain of difficulty breathing, be unable to catch their breath, and may begin to wheeze. The child almost always has a history of asthma and has appropriate medications with them, usually in the form of "metered-dose-inhalers" (MDI).

Children with asthma should have their inhalers with them at all times. However they should only use them when needed and should not overuse them.

Common medications for the management asthma are:

Proventil and Ventolin MDI (alupent) or Maxair Autohaler are bronchodilators used for acute shortness of breath, (two puffs every 4 hours as needed for shortness of breath or wheezing). The Maxair Autohaler is used in children because it fires automatically on inhalation avoiding the need for good hand/ lung coordination which others require to be effective.

Serevent MDI, a long-lasting bronchodilator, is to be used to prevent the bronchoconstriction-- IT IS NOT TO BE USED FOR ACUTE SHORTNESS OF BREATH. It is to be taken as 2 puffs every 12 hours.

Azmacort, Vanceril, Aeorbid, Beclovent, are a few of the steroidal anti-inflammatory agents that have become the cornerstone of asthma therapy. They are used to prevent the allergic reaction that triggers asthma as well as control the inflammatory response associated with an asthma attack. Depending upon which MDI is used, the dose will vary slightly, but, it is commonly given as 2 puffs every 12 hours. These agents are helpful, but not the main stay of treatment in an acute phase of asthma. In the case of an acute asthma attack, it is essential to use one of the fast-acting bronchodilators.

Intal (cromolyn sodium) or Tilade MDI are inhalers used to prevent bronchoconstriction. Usual dosage is 2 puffs 1/2 to 1 hour before physical activity.

Many children with asthma are also very sensitive to aspirin and other non-steroidal anti-inflammatory (NSAIDs) compound and can have a severe potentially life-threatening anaphylactic reaction. Therefore, use these products in children only if they have taken them before without incident.

Asthma is an air-trapping disease. During an attack the child can inhale but, because of the bronchoconstriction, they find it difficult to get all the air out. During an acute attack along with the use of inhalers (bronchodilators), you can also assist by doing the following: lay the child down and, as they exhale, compress the rib cage from the sides to help force out the trapped air. Repeat this procedure with three breaths; wait a minute before repeating the procedure; and continue until they're no longer in respiratory distress.

RULES TO LIVE BY - SEEK MEDICAL ATTENTION:

1. The child should always have their bronchodilator inhalers with them.
2. If they are wheezing or feeling short of breath, they should not exercise until clear.
3. Be careful in the use of aspirin/NSAIDs. When in doubt, use acetaminophen.

FLYING & ALTITUDE:

The biggest problem that children have with rapid changes in altitude, as can occur when flying or riding up a chairlift/tramway, are with their ears. The immature eustachian tubes that vent the middle ear into the posterior pharynx are easily occluded. As you go up the surrounding air pressure goes down. If the eustachian tubes are unable to vent, the change in pressure causes the eardrums to bulge outward creating pain.

When flying, this pressure problem can be minimized by having the child chew gum or suck. This action will open the eustachian tube allowing for pressure changes.

With young children, less than 3 years old, it is

inadvisable to take them up a chairlift or tramway with an altitude change of greater than 1000m (3000 feet) because of the this risk of ear pain and possible ruptured ear drum.

In a future issue we will discuss pediatric trauma and how to manage soft tissue injuries, fractures, dislocations, and pain in the pediatric population.

OUTDOOR FIRST AID KITS FOR FAMILIES AND CHILDREN

By Buck Tilton

When the family goes camping your ability to meet the first aid needs that might arise involves more than throwing a few neon bandages and children's aspirin in a plastic bag. Several manufacturers address the specific medical problems associated with families and kids in the woods with specific first aid kits.

Sawyer Family First Aid Kit

Within a zippered pouch the Family First Aid Kit from Sawyer contains an abundance of useful items for dealing with the most common family medical problems. Contents include but are not limited to self-adherent gauze, nine different pads and compresses, 28 different bandages, electrolyte tablets and instructions by William "Doc" Forgey, MD. Call (800) 940-4464 for ordering info.

Outdoor Research Family Camping First Aid Kit

Modular with two removal sections, the Family Camping Kit has a small, zippered pouch containing bandaging materials but no pills, liquids or sharp instruments (allowing a child to safely pack the pouch) and a larger pouch carrying pills, liquids and heavier items that can be packed by an adult or left behind on short hikes. The rest of the kit contains items useful on short hikes.

Contents of the Family Camping Kit includes but are not limited to burn ointment, kid-sized non-adherent gauze pads, insect repellent for children, syrup of ipecac, sweat-resistant sunscreen, anti-diarrheal tablets, children's strength chewable analgesics, lidocaine antiseptic towelettes and a first aid booklet. Call (800) 421-2421 for ordering info.

Atwater Carey Family First Aid Kit

A medium-sized, zippered pack containing a wide variety of materials intended to treat almost any injury sustained in the backcountry or at home, the Family Kit from Atwater Carey includes but is not limited to fabric adhesive strips, cohesive gauze tape, scissors, trauma dressings, tincture of benzoin compound, wound closure strips and the small book *Backcountry First Aid & Extended Care* by Buck Tilton. Call (800) 359-1646 for more info and credit card orders.

Atwater Carey Infant and Child Care Module

Designed to interface with other Atwater Carey first aid kits, the Infant and Child Care Module comes in a clear plastic bag and contains, among other items, child-safe liquid soap, child-safe sunscreen, child-safe insect repellent, multi-functional Derma Mend skin cream, oral rehydration salts, a bulb syringe, children's strength chewable pain relievers/fever reducers, a plastic whistle and general guidelines on caring for children in the wilderness. Call (800) 359-1646 for more info and credit card orders.

Atwater Carey Kidz Kit

Unique on the market, the little Kidz Kit is designed for children to use themselves and comes with easy-to-read instructional cards containing many life-saving facts. Also available for children who want to learn more, the book *First Aid for YOUths* by Buck Tilton and Steve Griffin, may be ordered from Atwater Carey with the Kidz Kit attached. Call (800) 359-1646 for more info and credit card orders.

Adventure Medical Kits Family Spirit First Aid Kit

Packed in a zippered pouch, the Family Spirit is designed for the entire family and includes, among numerous items, a digital thermometer, oral rehydration salts, an irrigation syringe, chewable tablets for pain and/or fever in children, syrup of ipecac and two resource manuals: (1) *Caring for Children in the Outdoors* by Barbara Kennedy, MD, and (2) *A Comprehensive Guide to Wilderness & Travel Medicine* by Eric Weiss, MD. Call (800) 324-3517 for more info and C.O.D. orders, or Chinook Medical Gear at (800) 766-1365 for credit card orders.

Adventure Medical Kits Pediatric Kit

Designed to be added to an existing first aid kit, the Pediatric Kit comes in a clear plastic bag and contains useful items chosen by a pediatric physician, Barbara Kennedy, MD. The kit includes Dr. Kennedy's small book, *Caring for Children in the Outdoors*. Call (800) 324-3517 for more info and C.O.D. orders, or Chinook Medical Gear at (800) 766-1365 for credit card orders.

THE MEDICINE CHEST ALLERGIES AND ANTIHISTAMINES

By Frank Hubbell, DO

During the summer months when pollen is everywhere; dust, spores and mildew abound; and bees, bugs, and insects are buzzing about biting and stinging, the incidence of allergies goes up dramatically. These "environmental" allergies are extremely common with symptom ranges from minor irritations and inconvenience to hypersensitive life-threatening anaphylactic reactions.

The symptoms of minor environmental allergies can include: a scratchy throat, itchy eyes, runny nose, sneezing, or itchy skin that may be associated with a mild skin rash. The more serious allergic reactions may include: swelling of the face, a skin rash characterized by large, raised red, itchy bumps (called hives or urticaria), swelling of an extremity, a sensation of shortness of breath, wheezing, or swelling of the airway with subsequent difficulty breathing. This last, more

severe reaction, when associated with the loss of the airway and difficulty breathing, is known as an anaphylactic reaction.

Anyone with a history of a severe allergic reaction or anaphylactic reaction must see a physician for diagnosis and a prescription and instructions for use of an *ANA KIT*. When an anaphylactic reaction occurs, this kit contains two doses of an injectable drug called Adrenalin (epinephrine) that will temporarily reverse the life-threatening reaction and an oral antihistamine, chlorpheniramine, that will control the reaction for hours, giving you time to seek medical attention.

The vast majority of allergies never progress to the more serious allergic reactions. Minor allergies are easily recognized and easily treated. The hormone in the human body that drives the allergic reaction is histamine - thus the use of antihistamines to control the symptoms of allergies. Although antihistamine will work to control the symptoms, some work better than others and have fewer potential side effects.

OVER-THE-COUNTER ANTIHISTAMINES:

Antihistamines that work well and are commonly available over-the-counter are:

Benadryl (diphenhydramine) available as an elixir or capsule. The usual dosage is 25 mg every 4 - 6 hours as needed for relief of symptoms. This drug is very safe in children.

Chlor-trimeton (chlorpheniramine maleate) available as either a syrup or tablet.

The usual dose of 4 mg every 4 -6 hours as needed for relief of symptoms.

Dimetapp (brompheniramine maleate) available as an elixir or tablet. The usual dose is 4mg every 4 - 6 hours for symptoms of allergies.

The primary potential side effect of these over-the-counter antihistamines is tiredness. If you are trying to drive and stay alert, this can work against you. If it is a child suffering from allergies, the antihistamine should be taken at bedtime to not only give relief of symptoms but also to help them sleep. However, be aware that in some children antihistamines cause hyperactivity, paradoxical excitement, instead of tiredness.

PRESCRIPTION ANTIHISTAMINES:

Claritin (loratadine) 10 mg, one tablet per day to relieve the symptoms of allergies.

Hismanol (astemizole) 10 mg, one tablet per day to relieve the symptoms of allergies.

Seldane (terfenadine) 60 mg, one tablet every 12 hours to relieve the symptoms of allergies.

The advantage of the prescription antihistamines is that the once or twice a day dosing is more convenient, and they cause less drowsiness. These antihistamines are not recommended for children.

WORDS OF WARNING:

1. All antihistamines can potentially make you sleepy, so when using them be careful not to drive or operate machinery.
2. All antihistamines can interfere with the sweating mechanism, our primary mechanism of cooling in hot weather. So, when taking antihistamines be very careful not to overheat which may produce heat exhaustion or a potentially life-threatening heat stroke when exerting or exercising.

WMN DISPATCHES

- According to a Boston University study, ibuprofen, when used to treat fever in children, is just as safe as acetaminophen. The risk of internal bleeding, kidney failure or allergic drug reaction was not increased by the short-term use of ibuprofen; however, the study did not indicate whether ibuprofen may have other, less severe side effects in short-term use. The study did not determine whether long-term use is hazardous.

- When evaluating potentially unstable spinal injuries, wilderness care providers need to pay close attention to "distracting injuries"; severe burns or contusions, deep lacerations, fractures of the skull, pelvis or a long bone, and even multiple rib fractures - more commonly known as "painful" injuries. In a letter to the editor of the *Journal of Wilderness Medicine*, Dr. Keith Conover reminded wilderness care providers that these injuries can "distract" the patient even though the level of the patient's distress may not give the telltale sign. The bottom line is this: do thorough assessments of the patient, establish the mechanism of injury, and evaluate the scene so that patients receive the best care possible, especially in patients with potentially damaged spines.

- A list of the top ten reasons for law suits following search and rescue missions was compiled by Norman W. Lawson, Jr. Those of interest include:

1. Having wrecks with emergency vehicles.
2. Dropping the victim.
3. Not starting the search or rescue effort soon enough.
4. If a rescue cannot be accomplished immediately, not doing something for a known victim in a known location.
5. Improper medical treatment for the victim.
6. Authorities in charge of the rescue refuse to call or deny participation to properly qualified rescuers.
7. Equipment failures and other problems.
8. Failure to follow the plan or s.o.p. of record.
9. Lack of communication and general foul-ups.
10. Record keeping problems.

The American Society for Testing and Materials (ASTM) has set up two new subcommittees which may be of interest to outdoor professionals and enthusiasts. The first subcommittee will work to develop standards for sleeping bags so that consumers can feel confident that they are getting what the label proclaims. Anyone interested in making comment or getting involved should contact:

Peter Frickland,
Cascade Designs,
4000 First Avenue, South
Seattle, Washington 98027
(206-583-0583 ext. 120; fax: 206-467-9421)

The second ASTM subcommittee that has been formed will address standards for portable water treatment products to help protect consumers. Again, interested parties should contact the subcommittee through:

Jeff Dekko
PUR/Recovery Engineering
2229 Edgewood Avenue, South
Minneapolis, Minnesota 55426
(612-541-1313 ext. 250)
or
Trina Peterson
Sweet Water
2505 Trade Center Avenue, Suite D
Longmont, Colorado 80503
(303-678-0447 ext. 129)

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Sept./Oct. '94	First Aid Kits
July/Aug. '94	Ozone & Ultraviolet Light
May/June '94	Zoonoses
Mar./April '94	Wilderness Pediatrics
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Nov./Dec. '93	Pre-Existing Medical Conditions (Asthma, Seizures, Diabetes, Hypoglycemia)
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THE FUTURE OF WILDERNESS MEDICAL TRAINING...AN UPDATE...

The following is an update for all Wilderness Medicine Educators on the standardization questions addressed in the January/February 1995 issue:

3 August 1995

Dear Wilderness Medicine Educator:

In March of 1995 an attempt was made to establish the National Association of Wilderness Medicine Educators (NAWME) in response to a need expressed at the 1994 Wilderness Risk Managers Conference, a need for national standards for pre-hospital wilderness medicine training curriculums and an accreditation process for institutions that offer such training. Our desire and intent was to increase professionalism within and further the validity of the pre-hospital wilderness medical care community for the benefit of all.

With the organization of the Pre-Hospital Emergency Training Standards and Accreditation Committee (PETSAC) of The Wilderness Medical Society, whose goal is virtually the same as those considered by NAWME, we no longer see a need for a separate organization.

As of this date, NAWME announces its dissolution, and pledges its support to the efforts of The Wilderness Medical Society on behalf of pre-hospital wilderness medicine. SOLO, WMA and WMI look forward to being active participants in the process.

Sincerely,

Frank Hubbell, DO, Lee Frizzell, Phil Gormley, Paul Marcolini, Melissa Gray, Buck Tilton and Holly Weber

The *Wilderness Medicine Newsletter* is intended as an informational resource only. Neither the *WMN* or its staff can be held liable for the practical application of any of the ideas found herein. The staff encourages all readers to acquire as much certified training as possible and to consult their physicians for medical advice on personal health matters.

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Feb. 5 - March 8 Conway, NH

Wilderness EMT
Sept. 11 - Oct. 6 Conway, NH
Nov. 27 - Dec. 21 Conway, NH
Jan. 2-26 Conway, NH
Jan. 3-26 Nantahala, NC (704-488-6737)

Wilderness First Responder
Sept. 1-11 Hulbert, VT (802-333-3405)
Sept. 11-19 Outward Bound (800-359-3620)
Oct. 2-13 Dartmouth, NH (603-646-2428)
Oct. 13-21 Outward Bound (800-359-3620)
Oct. 23 - Nov. 3 AMC, NH (603-466-2727)
Oct. 29 - Nov. 7 Wolfcreek, GA (706-745-5553)

Wilderness First Aid/WFR Recertification
Sept. 8-10 Hulbert, VT (802-333-3405)
Sept. 15-17 Ottawa, Canada (603-447-6711)
Oct. 13-15 Dartmouth, NH (603-646-2428)
Oct. 14-15 Lyndonville, VT (802-626-8987)
Oct. 21-22 AMC, NH (603-466-2727)
Oct. 21-22 AMC Worcester, MA (508-870-5997)
Nov. 4-5 AMC, NH (603-466-2727)
Nov. 17-19 Hulbert, VT (802-333-3405)

Wilderness/Rural EMT/FR Module
Aug. 28 - Sept. 1 Passages, WV (800-634-3785)
Nov. 18-22 SOLO, NH (603-447-6711)

NORTH AMERICAN RESCUE INSTITUTE
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Adv. High Angle, SOLO, NH (603-447-6711)
Rescue from Structure, SOLO, NH (603-447-6711)
Confined Space, SOLO, NH (603-447-6711)
Backcountry SAR, Hulbert, VT (802-333-3405)

MARINE MEDICINE INSTITUTE
c/o N.A.S., HC 60 Box 101, Medomak, Maine
Telephone: (207) 529-5880 fax: (207) 529-5233

Headquartered on the rock-bound Maine coast, the SOLO Marine Medicine Institute offers the following courses at their coastal base and at off-site locations:
"Medicine for the Mariner", a 16 hour program, based on data compiled by the U.S. Coast Guard, dealing with medical issues the mariner is most likely to encounter.

"Mariner First Responder", an 80 hour course exceeding the Coast Guard's requirements for mariners seeking licensing.

WILDERNESS MEDICINE INSTITUTE
PO Box 9, Pitkin, Colorado 81241
Telephone: (970) 641-3572, Mon-Thurs 9am-1pm

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Nov. 20 - Dec. 15 Kelly, WY (303-733-4765)
January 1-26, 1996 TBA

Wilderness First Responder
Oct. 3-12 Cascade Science School, Bend , OR
Oct. 3 - Dec. 12 UC Davis Extension, CA
Oct. 6-15 San Juan Island, WA
Oct. 15-24 Summit Adventures, Bass Lake, CA
Nov. 9-18 Jackson, WY
Jan 3-12, 96 Summit Adventures, Bass Lake, CA
Jan 5-14, 96 Whitman College, Walla Walla, WA
Jan 19-28, 96 Univ. of Montana, Missoula, MT

Wilderness First Aid/WFR Recertification
Sept. 16-17 Tacoma, WA
Sept. 15-17 Pablo, MT
Oct 7-8, Logan, UT
Oct. 17-18 San Juan Island, WA
Jan. 27-28 Albuquerque, NM

Wilderness EMT Refresher
Nov. 13-17 Pitkin, CO

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

SEPTEMBER/OCTOBER 1995 ISSN-1059-6518 VOLUME 6, NUMBER 5

HYPOTHERMIA—OR WHY DRESSING LIKE AN ONION KEEPS YOU WARM

by Franklin Hubbell, DO

As the earth makes its annual orbit around the sun, it spins on an axis that leans to one side. This tilt of earth's axis causes the northern and southern hemispheres to vary their distance from the sun. This varying distance from the sun's warmth and sunlight gives us the four seasons. In the northern latitudes we are rapidly approaching fall and then moving into the depths of winter. With the increasing exposure to cooler and cooler temperatures comes the heightened risk of hypothermia for the outdoor enthusiast. Once again, it is important to revisit that perpetual enemy in an effort to understand our physical limitations and the consequences of hypothermia. Understanding hypothermia allows us to survive and thrive in the cold with minimal risk and maximal enjoyment.

Humans are warm-blooded mammals, not cold-blooded reptiles. The difference is simple: reptiles do not waste energy trying to stay warm. Instead, they simply absorb heat from the surrounding environment. Their core temperature rises and falls depending upon their immediate environs, and, as a result, they do not suffer from hypothermia. When they absorb enough energy from their environment to elevate their core temperature sufficiently, they are able to function. Otherwise, they just sit around conserving energy waiting for conditions to improve.

Human mammals expend a great deal of energy maintaining a normal core temperature of 98.6 F/ 37 C which then allows us to function in a wide variety of environmental conditions, warm or cold, as opposed to our friends the reptiles who may be quite energy-thrifty but can only function when it is warm enough for them to scurry about and find dinner. However, if we do not maintain a normal core temperature, we will suffer the potentially life-threatening consequences of hypothermia.

To make matters worse, humans are true tropical animals. Had we been designed to live and thrive in a cold climate, we would look quite different - a thick layer of insulating fur would cover a heavy layer of fat. For tropical life we are virtually naked with minimal fur and inconsistent fat pads; and we sweat proficiently to get rid of excess heat. As a result of our tropical design, humans have few natural defenses against the cold making us very susceptible to hypothermia.

Humans are not only tropical animals, we are also mental animals in that our survival is based more on mental prowess than physical prowess. This is unfortunate because the brain is significantly affected by hypothermia. Watching someone become hypothermic is just like watching someone become drunk. Understanding prevention, recognition, and treatment of hypothermia allows us to perform well and enjoy the colder climates.

Normal core temperature is maintained by thermoregulation or the balancing of heat production versus heat loss. There are a wide variety of circumstances that can cause an imbalance in thermoequilibrium. When we lose more heat than we are producing, there is a decrease in core temperature causing hypothermia as compared to when we produce more heat than we can get rid of resulting in heat stroke or heat exhaustion.

Typically, accidental hypothermia is thought of as a condition occurring in adventurous individuals participating in high risk sports in a winter environment. However, hypothermia is much more common than that and can occur in almost anyone, in any environment, at any time of year when conditions cause us to lose more heat than we are producing. To appreciate and understand this balance, we must understand the principles of thermodynamics or how the human animal conserves or loses heat to maintain a normal core temperature.

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Heat is energy; energy is used to contract muscles, drive chemical reactions, and maintain life itself. In the case of the human animal, our normal physiology functions best at 98.6F/ 37C. At a normal core temperature the chemical reactions that sustain life occur at a predicable, controlled rate with predictable results. As the core temperature rises or falls, that control is lost and so is our homeostasis, or normal life-sustaining physiology.

PRINCIPLES OF THERMODYNAMICS — HEAT PRODUCTION VS. HEAT LOSS

HEAT PRODUCTION:

Nutrition & Hydration: On the cellular level heat production occurs from the oxidation of glucose (sugar). This is essentially the same process that takes place when a piece of wood is burned in a stove. Oxygen combines with the glucose (cellulose in wood is glucose linked together with a special chemical bond) which breaks chemical bonds thus liberating the energy that was put into that bond to form the glucose . The energy was stored in the glucose by plants that took photons of energy from the sun and combined carbon dioxide and water to make sugars such as glucose. Glucose is really nothing more than a plant's way of storing energy from the sun to be used at a later date.

As animals we do not have the ability to put energy into chemical compounds the way plants do. However, we can store energy derived from food stuffs as glycogen stores in the liver or in fat cells throughout the body, but this stored energy was ultimately obtained from a plant.

The energy gained from the breaking of the chemical bonds is then used to drive other chemical reactions and most importantly to maintain our normal core temperature. In fact, most of the energy liberated from food is burned in our cellular furnaces, the mitochondria, simply to maintain our core temperature and normal homeostasis.

Since the utilization of glucose to produce heat helps to maintain our normal core temperature, sustaining blood sugar levels by snacking frequently on carbohydrate foods is essential to preserving a normal core temperature in a cold environment. Of equal importance is hydration.

Other than oxygen, the single most important substance to normal functioning of the human physiology, and life itself, is water. We can only survive minutes without oxygen, a few days without water, but we can go weeks without food. Maintaining adequate hydration is essential to staying warm in a cold environment and cool in a hot environment. Large quantities of water are necessary to digest and metabolize food stuffs liberating energy and providing the essential nutrients for survival. Dehydration slows metabolism thus contributing to the lowering of the core temperature.

It is important to drink often in a winter environment, even if not thirsty, because the cold, as well as altitude, can blunt the thirst mechanism predisposing you to dehydration. Consume enough water to maintain frequent urination, voiding at least every 2 - 3 hours. If you are well-hydrated, the urine will be light yellow to clear. If you are becoming dehydrated you will go less frequently. The urine will become dark as the waste products become concentrated in an effort to conserve water.

Exercise: The production of movement occurs through the contraction of muscles. This is again driven by a series of chemical reactions that not only produce the desired effect of purposeful movement but a byproduct - heat. The heat generated by physical activity can be used to keep us warm on a cold day.

External heat sources: We can also absorb heat directly from our environment. While standing in the sun or sitting next to a roaring fire or wood stove we can soak up the heat just like our friend the reptile.

HEAT LOSS:

Conduction: Conductive heat loss occurs when heat is transferred from a warmer object to a colder object. How rapidly this occurs depends upon the temperature difference between the two objects and the interface or the type of materials that are in contact. A naked person sitting on a frozen rock is going to lose heat much faster than an appropriately-dressed person sitting on an ensolite pad on a frozen rock.

Convection: Convective heat loss occurs when heat is transferred from a warm object into the air. The heated air is then carried away by either air currents, a breeze, or by the warmer air rising. Wind chill factor takes into account the increased rate of heat loss when the wind blows making the affective temperature lower than it really is.

Radiation: Heat is given off by every object including the body above absolute zero in the form of infrared energy, an invisible spectrum of light. Something glowing red hot is giving off a tremendous amount of infrared energy that can be felt if you are standing close enough to it. A frozen object is still giving off some infrared energy but much less.

Evaporation: It takes tremendous amounts of energy to evaporate water. In order for water to evaporate, it has to absorb sufficient energy (heat) from its surroundings to get the molecules bouncing around fast enough to escape the surface of the liquid as individual water molecules. The skin, through sweating, takes advantage of this form of heat loss to help maintain thermoequilibrium when it is hot.

The skin, or integumentary system, is the largest organ in the human body and has a variety of responsibilities. One of the most important is thermoregulation. The skin takes advantage of the principles of thermodynamics to help maintain normal body core temperature.

If we begin to overheat, the capillary beds in the skin will dilate bringing the warm blood to the cooling surface. When this is not enough to reestablish equilibrium, the sweat glands will produce water i.e. sweat that can evaporate off the surface of the skin dramatically increasing the cooling efficiency. In order for sweat to cool, it has to be able to evaporate; if the humidity is too high, the sweat cannot evaporate and the individual is at risk of overheating and developing heat stroke.

The evaporation of sweat accounts for about 90% of the cooling efficiency of the human body. This can work for us in hot weather; however, in cold weather if we become wet, our risk of over-cooling and hypothermia is dramatically increased. Therefore, one of the most important principles in preventing and treating hypothermia relates to moisture. We cannot rewarm a wet and cold hypothermia victim. It is absolutely essential that they are dry and they remain dry. This same principle applies to the active outdoor enthusiast. If we become damp or wet from sweat, rain, snow, or fog, rate of heat loss increases significantly. This can work in our favor if we are very active and producing more heat than needed. However, if we are not very active, the moisture against our skin will tip the scale the wrong way and we will end up losing more heat than we can produce.

Natural defensive mechanisms against a falling core temperature occur as we begin to lose heat faster than we are producing it. To prevent the warm blood from reaching the outer layers of the skin and being cooled, the capillary beds in the skin will vasoconstrict. This action will help to conserve the heat that is being produced in the core. If this is not enough to reestablish and maintain core temperature, the brain will stimulate useless muscular contractions, in the form of shivering, for the heat-produced byproduct of the muscular activity.

PREVENTION OF HYPOTHERMIA:

KNOWLEDGE: Knowing and understanding this enemy allows us to enjoy the extremes of climate with confidence and ability.

STAY DRY: Stay dry. If you become wet, change into dry clothing. Carry extra dry clothing so that you can get dry.

PACING: Set a pace that is good for the group, a pace that is fast enough to keep everyone warm but slow enough to prevent overheating and sweating.

DRESS LIKE AN ONION: Dress in multiple thin layers so that as your activity level increases, you can ventilate or strip off layers as needed to control heat loss.

RAINGEAR: Always carry raingear-- both tops and bottoms. Put it on before it starts to precipitate. It is much easier to stay dry then to get dry.

EXTRA CLOTHING: In cold weather carry extra clothing, especially an extra dry top, hat, and mittens or spare socks(that can be used as mittens if needed).

STAY HYDRATED: Stay well-hydrated. Cold, dry air will blunt the thirst mechanism. Dehydration slows metabolism and contributes to the risk of hypothermia.

EAT OFTEN: Snack on carbohydrates to maintain your blood sugar level so that you have fuel to burn.

CLOTHING: Do not use cotton clothing in a cold environment as it will increase heat loss dramatically when it becomes wet. Instead use synthetics, such as polypropylene, or wool fabrics. These fabrics will continue to save heat even when wet.

Every year hundreds of outings are spoiled by encounters with hypothermia. Easily prevented, hypothermia should be one of the first and foremost concerns of any outdoorsperson.

RECOGNITION OF HYPOTHERMIA:

Progression of hypothermia by degrees of core temperature:

98.6F - normal core temperature and function
96.6F - brain function impaired, loss of judgment & problem-solving
96F - defense mechanisms against the cooling begin with the onset of shivering and vasoconstriction of the blood vessels in the skin
94F - musculoskeletal system becomes impaired, staggering and tripping begin
- shivering intensifies
92F - musculoskeletal system becomes impaired to the point where walking is impossible
- shivering becomes even more intense
90F - unable to walk or crawl, curled-up in the fetal position.
- shivering in convulsive sessions.
86F - shivering has stopped and the person appears lifeless and pulseless.

If an individual finds themselves in a situation where they are losing more heat than they are producing, the core temperature will begin to drop. As it drops, the first vital organ to be affected is the brain. In the long run cooling of the brain is ultimately harmless— when an individual recovers from an hypothermic episode, their brain recovers completely. However, in the short run as the brain cools, normal neurological function becomes impaired starting at around 97F - 96F. The first evidence that this is occurring is that the victim becomes very apathetic with a blank expression on their face.

The first function of the brain to become impaired is that of abstract thinking, problem- solving, and judgment. This is the

most important aspect of hypothermia; this is how and why hypothermia leads to other problems and why hypothermia is so deadly. An individual out hiking in the mountains, for example, has to be constantly aware of their surroundings. They have to be able to follow a trail, monitor themselves for thirst, hunger, blister formation, etc. and constantly evaluate the weather for changing conditions. As the core temperature drops, the brain cools slightly, and these life-sustaining mental functions cease. As a result, the individual may become lost or benighted. They may be exposing themselves to serious danger without being aware of it which can obviously result in serious injury.

As the body continues to cool, the defense mechanisms to prevent any further heat loss and start rewarming begin around 96F. The blood vessels in the skin will vasoconstrict, or get smaller, to reduce the blood flow to the skin thus minimizing heat lose via the skin route. At the same time the brain will cause opposing muscle groups to pull against each other causing shivering. This" purposeless" muscular activity is very effective at producing heat and is the body's primary effort to actively rewarm. However, shivering interferes with other "purposeful" muscular activity making it very difficult or impossible to continue ice climbing or skiing, or to set up a tent for shelter, or light a stove to make a warm drink. So, while shivering is an effort to produce heat and rewarm, it can at the same time be very debilitating and limit physical activity.

As the body continues to cool, the shivering intensifies in an effort to produce more heat and increase core temperature. As the core temperature drops, the shivering intensifies which interferes with the musculoskeletal system making it more and more difficult to walk or climb. At 94F the victim begins to trip and stumble; by 92F it is almost impossible to walk; by 90F they are immobilized and will curl into a fetal position to conserve heat.

When the core temperature approaches 90F, the shivering mechanism begins to fail and the victim begins to shiver in convulsive fits. They will shiver violently for a minute and then rest for a minute. As the shivering mechanism continues to fail, the duration of shivering will get progressively shorter and the intervening rest periods longer.

At around 86F the shivering mechanism fails completely. At this point the individual appears breathless, pulseless, and ashen gray as if dead. They are not dead, however; they are in a state of hibernation, or more accurately, suspended animation, and if treated properly can be resuscitated.

THE PRINCIPLES OF HYPOTHERMIA MANAGEMENT:

Create a stable environment. Remove the cold victim from the cold environment. Just as you cannot treat a burn in a burning building, you cannot treat a cold injury in a cold environment. The victim needs to be removed from the cold water, the ski slope, the unheated apartment, or the mountainside. This may be accomplished simply by moving the cold victim into the back of a heated ambulance or may be more difficult because the victim is deep into the backcountry above treeline. Often, though, the move may be even more complicated because the victim is in the backcountry or on a mountainside. Whether tent, bivouac, snowcave, or cabin, a stable environment must be established. In some cases this may initially be a move below treeline out of the weather until other shelter can be set up. The stable environment is not necessarily warm, but it has to provide protection from the elements.

Get them dry. All hypothermia victims are wet or damp. Once the victim is in a stable environment strip them out of their clothes, dry them off, and keep them dry. It is impossible to rewarm someone who is wet or damp. Water is an excellent conductor of heat and small quantities of evaporation will rob massive quantities of heat from the patient.

Build a hypothermia wrap. The hypothermia wrap itself does not produce any heat— it is a thermos bottle around the patient to trap and hold all the heat that they are producing. The principles are to insulate the patient like an onion with multiple layers, and wrap them up like a burrito.

Once they are dry, reinsulate them to conserve heat and prevent heat loss:

- CONSERVE HEAT by surrounding the patient with multiple layers of dry, high-loft insulation.
- PREVENT
  - **conductive heat loss** by placing an ensolite pad or other dense insulator (Dr. Murray Hamlet suggests bubble wrap or cardboard as alternatives) between your patient and the cold ground.
  - **convective heat loss** by surrounding them with a windproof layer.
  - **evaporative heat loss** by keeping them dry with a surrounding waterproof layer.
  - **radiational cooling** with multiple layers of insulation and a space blanket with the reflective layer facing in.

To build an effective hypothermia wrap a rescuer needs:

- an ensolite pad (or other dense insulating layer) for the patient to lay on.
- multiple layers of dry insulation, blankets or sleeping bags.
- a windproof, waterproof layer, typically a 10 foot by 10 foot 4 mil piece of plastic.

Lay the 10' x 10' sheet of plastic on the ground. Next, place the space blanket with the reflexive side up. Then, in the center put the ensolite pad, and on top of the pad, place the multiple layers of insulation (blankets or sleeping bag). Finally, on top of the unfolded dry insulation, lay the dry

hypothermia victim. Fold the multiple layers of insulation around the patient ending with the plastic wrap. Pay particular attention to the patient's head and feet as these are two areas of extreme heat loss.

Treat the patient. Because they have been shivering in an effort to rewarm themselves, hypothermia victims have used up all of their glycogen stores and has a very low blood sugar. As their blood sugar falls, their ability to shiver and produce heat will begin to fail. Shivering is the most efficient way for someone to rewarm. Because of massive vasoconstriction associated with the cold response in the skin, the volume depletion associated with cold diuresis and the potentially harsh, cold weather conditions, it may be virtually impossible to start an IV. If the patient is conscious and shivering, use oral rehydration. Make a sweet drink with warm water and JELLO added as a source of sugar. (Do not use Nutrasweet Jello - it is of no value). Have them slowly sip this at a rate of 1 cup every 15 minutes.

Chemical heat packs inside the hypowrap may be applied to the axilla, stomach, palms of the hands, and soles of the feet. These do not add much heat to the patient; rather, heat packs offset the heat being lost out of the heat wrap system.

Warm moist oxygen may also be given if available. Generally, this is not feasible until the patient is in the back of the ambulance.

THE PRINCIPLES OF HYPOTHERMIA:

Prevention is essential. Know your enemy, appreciate your environment, and understand your human mammalian limitations.

The instinct for self-preservation is lost. Hypothermia is extremely dangerous and leads to accidents and lost hikers because of its effects on the brain. The individual does not know or care that they are becoming hypothermic.

Stay well-hydrated. Dehydration slows normal metabolism and heat production and contributes to hypothermia.

Stay well fed. Maintain blood sugar. This is the fuel you burn in the body's furnace to stay warm.

Stay dry: Set a reasonable pace. Carry extra warm, dry clothing and raingear.

The single most important factor is humility. We are a tropical animal, not a cold weather creature. Therefore, when we venture into the cold, we have to be armed with knowledge and know how to use it. Essentially, we have to know how to maintain a small tropical environment between us and the cold.

TSUNAMI AT GRAJAGAN

by Dan De Kay

It is two in the morning. You are deep asleep after a day of hard physical activity. Your bamboo hut is twenty feet above high tide line, and you are five thousand miles from home.

Suddenly you are awakened by what sounds like a 747 taking off directly over you, and the next instant a wall of water pushes you through a rapidly collapsing hut and into the surrounding jungle. In the turmoil you manage to hang onto a medium-sized tree, and shortly the water recedes, leaving an eerie silence that is punctuated by the cries of your fellow travelers.

This was the experience of two New Zealand surfer-physicians in June of 1994. They were camped in a remote area of Indonesia, days from the nearest medical facility, when an offshore earthquake caused a twenty-foot tidal wave to inundate their camp and the neighboring village of Grajagan. Three hundred people were killed and 1500 were injured.

"There were sharks in the bay for days afterward, eating the bodies of the dead villagers who had been drowned and washed into the sea," said Dr. Tom Mullholland, recounting the experiences during the days that followed.

"We had many injuries among the surfers at the camp," said Dave Arden, the other kiwi doc in attendance. The injuries included numerous deep lacerations, two broken arms, a crushed chest with a hemo-pneumothorax, and several people with salt water aspirations. Compounding these problems were contaminated water and a complete lack of electricity for lighting.

"Fortunately we were not hit as hard as Grajagan, where the greatest amount of damage was done by the tsunami. Several hundred people were killed there," recalled Dave." We had to search for fuel in order to sterilize water so we could clean and dress the wounds. We made makeshift splints for the broken arms, and it was two days before we could evacuate the most seriously injured."

Evacuation required finding an intact boat, then a long boat ride in rough seas to the nearest road. The injured were then taken by bus to an airport and flown to Bali for treatment.

"It was frustrating because we knew what the injured needed but had few supplies and little help," Tom told me months later in New Zealand. "We had to improvise practically everything from what was left after the wave hit us. And because of damage to the area, we were unable to get to the village to help with their wounded. It was one of those disasters that you read about in the newspaper but never think will happen to you."

How many of us dream of a vacation in some exotic locale? Does your job take you to remote areas? Do you live there? The experiences of Tom Mullholland and Dave Arden could happen to any of us. Personally, I'm glad I've had wilderness medical training.

WHO'S WHO IN WILDERNESS MEDICINE AN INTERVIEW WITH DR. KEITH CONOVER

by Ken Thompson

Dr. Conover is past advanced-EMT crew chief with a rural rescue squad, past Appalachian Region Chairman of the Mountain Rescue Association and still a certified and active mountain and cave rescue team member, medic command physician for Allegheny County, and professor of emergency medicine at the University of Pittsburgh. He is also the Medical Director of the Wilderness EMS Institute, which promotes Wilderness EMS research. That institute, WEMSI for short, is developing a detailed Wilderness EMT curriculum and has started a model wilderness EMS system centered in the mid-Atlantic states.

Dr.Conover has been an EMT and paramedic instructor since the early 70's. He contributed to the first ("480-hour") D.O.T. Emt-Paramedic Curriculum and the new EMT-Basic Curriculum. His varied EMS activities include serving in local EMS Councils, the Pennsylvania Emergency Health Services Council, as chair of the ASTM Task Group on EMT-Prehospital, and as chair of the ASTM Subcommittee on Search and Rescue Personnel, Training, and Education.

WMN: Dr. Conover, tell us about yourself and wilderness emergency medicine. What got you started?

Dr. Conover: "Those things are directly related. My EMS interest developed from the wilderness. My parents used to take me on mountain vacations as a small child. My solo hikes only sometimes had my parent's permission. I often had to explain to Rangers that I wasn't lost or missing, just having a nice hike! I became a seasonal Ranger myself, in National Parks including Yosemite. If there hadn't been a Park Service hiring freeze when I was accepted to medical school, things might have been a lot different."

WMN: You are considered to be a leader in your field, what do you consider your most significant contribution?

Dr. Conover: "Staying alive despite an interest in the outdoors and an excess of testosterone in my younger years."

"But seriously, I think my major accomplishment has been to create recognition of the needs of the wilderness provider in the EMS community, which has lagged behind the wilderness medicine community in this regard. And I see the work of WEMSI in developing a detailed, peer-reviewed curriculum and textbook, and a model WEMS system in the mid-Appalachian area, as critical to this goal."

WMN: If you were a medical advisor to an outdoor program or wilderness-oriented organization, what advice would you give regarding a specialty of yours -- confined space rescue?

Dr. Conover: Trip leaders for cave trips: take the National Cave Rescue Commission Level I class, or, better yet, Level I and Level II. I personally vouch for the quality of the courses put on by Eastern Region NCRC each June near Elkins, WV. Contact: John Appleby, ER-NCRC Regional Coordinator, 899 Kulp Rd., Perkiomenville, PA 18074, John B. Appleby applebjb@ttown.apci.com, 1-215-541-4994 (H).

WMN: Do you have any specific advice for outdoor programs and how they should approach setting up medical guidelines?

Dr. Conover: "I think there are lots of physicians, especially those now graduating from emergency medicine and other residencies, who are interested in the outdoors and would make wonderful medical advisors for outdoor groups. And I think it would be wise for each outdoor group to have a medical advisor who provides protocols for the group, based on trip leaders' training and expertise, and based on the kind of trips the group takes. A group medical advisor can help with minor preventative care for those without a family physician (e.g., tetanus shots every 5 years for those going on wilderness trips)."

"A group medical advisor can give advice on first aid/medical kits to take, which medical training for trip leaders to take, and the like. Outdoor groups can direct physicians without much experience to conferences such as the Wilderness Medical Society's annual meetings to get more background on wilderness medicine in general, and emergency physicians with large groups or outfitters can take courses such as the Wilderness Command Physician course offered by the Wilderness EMS Institute Or SOLO's Wilderness Trauma Life Support course that will help equip them to deal with medical direction for such organizations."

"Can't find a physician? Contact your local hospital emergency department of the county or state medical society. Keep bugging them if you don't get results right away. Doctors are only human, so get in their faces and try to drag them to a meeting or out on a trip. Having a physician medical advisor, even one without expertise in the subject, can open many doors to an outdoor group."

WMN: Are you willing to have people write to you? If so, where?

Dr. Conover: My schedule and various involvements make me a very difficult person to reach. Sorry, but that kind of comes with my job. For WEMSI publications and for information about WEMSI WEMT and Wilderness EMT courses offered by the Center for Emergency Medicine of Western Pennsylvania:

Attn: Pamela Westfall, Administrative Assistant
Center for Emergency Medicine of Western PA
230 McKee Place, Suite 500
Pittsburgh, Pa 15213-4904
(412) 578-3203

For other business correspondence:
Attn: Keith Conover, M.D., Medical Director
Wilderness EMS Institute
c/o Department of Emergency Medicine
Mercy Hospital of Pittsburgh
1400 Locust Street
Pittsburgh, PA 15219-5166

THE PURPLE PEOPLE HEATER™

by Franklin Hubbell, DO

One of the newest pieces of equipment being produced specifically to manage emergency medical patients in a cold environment is a hypothermia rewarming system fondly known as "The Purple People Heater.™"

This self-contained, easily transported thermal conservation system is designed to minimize heat loss by employing the principles of thermodynamics, i.e. preventing the transfer of heat by conduction, convection, radiation, and evaporation, while at the same time maintaining a system of easy access for continued patient care and monitoring.

Features that minimize heat loss include a built-in layer of ensolite under the patient to lessen conductive heat loss; waterproof inner and outer layers and a complete velcro closure system to help check convection heat loss; noncompressible thermal layers of synthetic insulations to slow radiational heat loss; and both waterproof inner and outer layers and the layer of synthetic polar fleece in which the patient is wrapped to prevent evaporative heat loss.

The Purple People Heater™ fits into its owns storage and carrying case with backpack straps. The backpack-style system also affords room for the rescuer's own equipment such as raingear, warm clothing, food, water, and a bivy kit. Without the rescuer's gear, the complete system weighs 15 pounds, is 3 feet tall and 16 inches wide. Its light weight and straps make the PPH easy to transport.

Other features of the PPH make it an extraordinary rescue tool. The velcro enclosures allow for continuing care and monitoring. Easy clean-up is possible because the waterproof layers can be sponged off and the fleece liner can be removed and laundered.

Designed by folks from SOLO, internationally recognized experts in the field of wilderness emergency medicine and rescue, the Purple People Heater™ is ideal for any rescue team that may have to manage patients in a cold environment or treat cold-related injuries.

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

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CHEST INJURIES IN THE WILDERNESS

by David Tauber, NREMT-P

Chest injuries in the wilderness range from minor muscle pulls and rib fractures to life-threatening pericardial tamponade and aortic rupture. A backpacker trips and falls on a rock, a backcountry skier impales herself upon a branch, a climber pendulums into the cliff...it is easy to imagine receiving a chest injury in the field or having to take care of a patient with a chest injury in the backcountry. Each of these scenarios can cause everything from a simple but painful broken rib to a flail chest or pneumothorax. Although chest injuries cause 25% of the trauma deaths in this country, in the urban setting less than 15% of these injuries require an operation. These statistics suggest that the care in the field would be simple, and it can be if you understand the anatomy and the physics of respiration.

The principle concern in chest injury is usually hypoxia; therefore, most of our treatments are directed toward maintaining or restoring adequate ventilation. The chest cavity contains the lungs and heart and the structures that support their function. These structures, moving down the respiratory tree, include the trachea (wind pipe), the right and left main stem bronchi, the bronchioles, the respiratory bronchioles and the alveoli (where oxygen exchange actually takes place). Respiratory support structures include the chest wall itself - the ribs and intercostal muscles - and the diaphragm, which divides the thorax from the abdomen. The lungs are lined with tissue folded back on itself to create a double layer, called the pleura. The visceral pleura lies next to the lungs, and the parietal against the ribs. Normally, these two membranes fully contact each other, with a small amount of fluid to lubricate and maintain negative pressure between the layers. This negative pressure keeps the lungs from collapsing after exhalation. Also contained in the chest are the heart and the great vessels: the aorta, inferior and superior vena cavae, and the pulmonary veins and arteries.

Thoracic injuries can be either open or closed, depending on whether there is a wound penetrating the chest wall. A hole in the chest wall allows lung to collapse, because air entering through the hole neither enter the lung nor participates in respiration. Air outside the lung, but trapped inside the chest cavity, is called a pneumothorax (from Greek roots, meaning "air in the chest"). The common name for an open pneumothorax is a sucking chest wound, although not all open chest wounds make a sucking sound. The most reliable signs and symptoms of this injury include extreme difficulty in breathing with reduced breath sounds on the affected side. Without a stethoscope in the wilderness this can be detected by listening with your ear on the chest, and comparing at the same level on the opposite side. Other signs of open pneumothorax include elevated respiratory rate; in some cases, lateral tugging of the trachea; and, of course, a wound in the chest, back or abdomen.

Treatment of an open chest wound starts with applying an airtight seal: a plastic baggie, a piece of garbage bag or tin foil, a latex glove, or if nothing else is available, a soaking wet bandanna. The material should be sealed on at least three sides with medical tape or duct tape. If the material used for the dressing is stiff, like tin foil, then the patch should be sealed on the fourth side. If the material is pliable, it may be better only to seal three sides and leave sufficient overlap on the fourth to create a path for pressure to escape. During inhalation, lower pressure within the thoracic cavity causes the material to be sucked against the chest, barring air from entering the chest, but still allowing it to escape upon exhalation, when intra-thoracic pressure is increased. If you have completely sealed an open chest wound (taping down all four sides) and the patient gets worse— specifically is having greater difficulty breathing, is taking shallower breaths, has neck veins bulging out, or the trachea shifting away from the injured side— the seal has created a tension pneumothorax, and you need to release the pressure by opening the seal. If opening the seal alone doesn't make the patient better, it may be necessary to open the wound a little larger with a gloved finger or even the hollow inside of a ball point pen. If this

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still doesn't work or if these signs and symptoms present from a closed chest injury, then you may have to decompress the chest with an IV needle from your first aid kit.

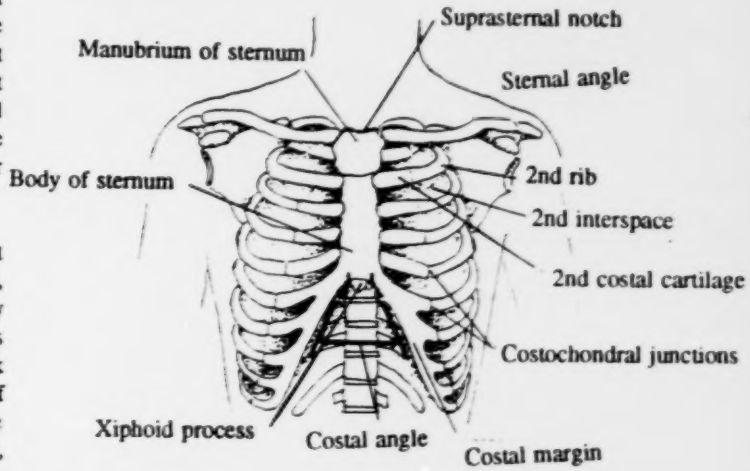
To decompress the chest: find the second rib down from the clavicle directly in line with the nipple on the wounded side; this is the side the trachea has shifted away from. Insert the needle so as to purposely hit the rib, then slide the needle up over the rib until a rush of air comes out and the patient gets noticeably better. Next tape the needle in place and cut the finger of a rubber or latex glove or a plastic baggie and place over the end of the needle. Tape securely to the needle and puncture the other end of the finger to make a "flutter" or one-way valve.

One cause of an open chest wound is that an object becomes impaled or stuck in the chest. When this happens, it is usually safer to leave the object impaled rather than to try to remove it. Much like the fable of the Dutch boy with his finger in the dike, the impaled object may be "holding back the sea" by plugging the wound. The standard treatment of impaled objects is to use an air-occlusive dressing around the object to seal the open pneumothorax and then build a bulky, stabilizing dressing up around the object to hold it in place. It may be possible to cut or break the object down closer to the skin first, but this should only be done if it will not move the object around.

In the wilderness there may be reason to deviate from this standard of care. If the object is excessively big and can not be cut down or stabilized in place for evacuation, you may obviously have no choice but to remove it. If the object is metal, an ice axe for example, it may have to be removed in a winter environment because it acts as a heat sink, drawing valuable heat away from the body's core. The patient may die of hypothermia before any respiratory insufficiency.

Most other chest injuries are not as obvious as a hole in the chest and require a higher degree of diagnostic skills. Some of the most dangerous may only become life-threatening with time. As always, the issue with wilderness care is time.

Rib fractures are a good example of a chest injury that is usually not an immediate life threat, but which over the long term, can result in other potentially serious respiratory problems such as pneumonia. Rib fractures can happen with as little as 7psi of force, such as the force generated by a good coughing spell. Point specific pain is characteristic of rib fractures; if you tap anywhere along a broken rib, it will hurt back at the fracture site. The pain is also both pleuritic (meaning it is worse with deep breathing) and orthopedic (worse with movement). Because of its pleuritic nature, it is normal for patients to self-splint by shallower breathing. However, this shallow breathing keeps oxygen from reaching the deepest recesses of the lungs- the alveoli- where it then passes across a membrane into the bloodstream. This can produce atelectasis (collapse of alveoli) and pneumonia, so treatment of simple (non-displaced) rib fractures is focused on promoting normal breathing. Pain relief with over-the-counter medications such as aspirin, Tylenol, or possibly Tylenol #3 (Tylenol with codeine) is the best course of action. The practice of taping the ribs should be discouraged because it prevents normal chest wall movement. It may be necessary to use a sling and swath on the affected side, however, to aid in pain reduction.



Multiple rib fractures may present a more immediate problem. We pull air into our lungs by the action of intercostal muscles and diaphragm. When we inhale, the diaphragm pulls down and the intercostal muscles, which are attached to the ribs, pull the ribs up expanding the chest space. This decreases pressure in the chest (actually, only a tiny bit: from 760 mm/Hg to 759), and air from the outside- at 760 mm- rushes in to equalize the pressure. If two or more ribs are broken in two or more places, the free-floating, or "flail," segment is no longer part of the chest wall and may not expand with the rest of the chest. This means air is not moving in and out, and oxygen is quickly used up. Since the essential problem is the inability to create a lower pressure in the chest, the critical treatment is to push the air in ("positive-pressure" ventilation). This can be accomplished by using a pocket mask on a conscious patient and working with him or her to produce an adequate depth of ventilation. Archaic treatments such as piling weights or sandbags on the flail segment, or taping the chest, are based on the false assumption that the flail segment moves outward (called paradoxical movement) when the rest of the chest is moving inward. In reality, the flail segment is immobile. The illusion of movement is much like sitting at a stop light when the car next to you starts to roll. Generally, you think you are rolling in the opposite direction.

A longer-term concern with flail injuries or blunt chest trauma is a contusion (bruising) of the lung. With a bruised lung, as with bruises to skeletal muscles, small blood vessels are broken and bleed into the lung tissue, possibly compromising ventilatory exchange. Like the flail chest, there is no specific treatment other than ensuring adequate ventilation and oxygenation (if available). In children a pulmonary contusion may be present without rib fractures due to the flexibility of children's ribs.

Rib fractures may be suggestive of other injuries; specifically, fractures of the lower ribs on the left are associated with splenic rupture twenty percent of the time (look for shock, bruising over the left flank and left shoulder pain). Ten percent of lower right rib fractures are associated with liver injuries (another solid organ prone to bleeding and shock). It is interesting to note that if a patient is ventilating adequately despite the pain of single or multiple rib fractures (or if the pain can be controlled with drugs), the patient may not need hospitalization.

As with the lungs, trauma to the chest can bruise the heart. The principal signs of myocardial contusions are chest pain and an irregular pulse. The chest pain should be treated with oxygen, (if available), complete rest, and Tylenol (but not aspirin, unlike a heart attack). The more irregular the pulse, however, the more unstable the patient and the greater the potential for sudden death from arrhythmia (irregular heart beat).

If the bruise to the heart is actually a broken blood vessel, bleeding into the pericardial sack may squeeze the heart, preventing it from refilling during diastole. Called "pericardial tamponade," signs include jugular vein distension (this must be checked with the patient sitting up), distant, muffled heart sounds (listen with your ear to the patient's chest), a narrowing pulse pressure (if you have a blood pressure cuff), and the final sign - no pulse. Unfortunately the only treatment for pericardial tamponade is to insert a long needle from below the xiphoid process toward the left nipple at about a fifteen degree angle. The needle must be attached to a syringe, and if possible, a lead from an EKG monitor. It is rare to find these items in a backpack, but luckily, pericardial tamponade is not that common.

A more catastrophic injury to the chest comes almost exclusively from high speed frontal impact, for example, skiing into a tree. This injury is when the loose arch of the aorta (the main artery coming off the heart, about the size of your thumb) slams forward into the chest pulling on a ligament that anchors it to the pulmonary artery. If the aorta rips through, the patient bleeds his or her entire blood volume internally within one minute. But if the force is less severe, the tear may only go through the inner of the three linings that make up the aorta. Called a dissecting aneurism, the only way this might be assessed in the field is if there is a noticeable difference in pulse of more than 10-20\bpm from one wrist to the other. The only treatment is rapid evacuation.

Another possible cause of respiratory compromise is a third-degree burn all the way around the chest. This could happen aboard a ship at sea or possibly from a stove explosion burning someone wearing a polypropylene top. The eschar (burned skin) is not pliable like regular skin and does not stretch with the swelling that accompanies the burn. Since the chest cannot expand, the patient suffocates. Treatment is an "escharotomy," where the skin is opened with a knife, enabling the chest to rise. Because skin with a full-thickness burn has no functional nerve endings, the patient will not feel the procedure. If the cut is made down the midline of the sternum, the bone will prevent you from cutting too deeply. It is only necessary to make the cut deep enough to have the skin pop open like an over grilled-hot dog. Treat the wound as you would any other open wound in the wilderness.

There is one more cause of acute respiratory distress in the traumatized patient worth mentioning. However, it is not from a chest injury. Say you are in a bivouac taking care of a patient that you and your partner splinted for a simple lower leg fracture about sixteen hours ago. Your partner hiked ten miles to get help and you don't expect the rescue team until daylight, three hours from now. Suddenly your patient coughs and develops acute shortness of breath with right-sided chest pain. You are puzzled. This had seemed to be a simple lower leg fracture of both bones, but just to be sure, you had done a thorough secondary survey, including a chest exam. You found no injuries at that time. Your patient had no previous health problems and takes no medicines. Since the patient seems to be in a fair amount of distress, you do another thorough chest exam: no bruises or wounds visible, no pain upon palpation of the chest, trachea is midline, and there is no jugular vein distention. When you put your ear to the patient's chest, you hear a slight wheeze on the right side only, with clear breath sounds on the left. The respiratory rate is 28 and labored and the patient is beginning to look a little blue. Creating this situation is a pulmonary embolus.

An embolus is a clot, bubble, or piece of bone marrow that enters the blood stream and travels to the lungs. Upon reaching the lungs, the embolus gets stuck in the decreasing diameter of the pulmonary veins. This blockage prevents blood from flowing past the alveoli and picking up needed oxygen. To prevent pulmonary emboli, change the patient's position frequently, making sure the circulation in the lower extremities is not compromised. If possible wrap the legs in ace bandages for a short time each hour or two. It may also be helpful to give the patient an aspirin if the patent is not allergic and internal bleeding is not suspected. Treatment after the fact may be more of a problem. Turning the patient on his or her left side may help if it does not compromise any other care. Lacking supplemental oxygen in the wilderness, the best course of action is to evacuate while maintaining adequate ventilation. Be warned that this can prove to be extremely difficult in rugged situations.

Most chest injuries are minor but should always be evaluated with caution due to the vital functions of the thoracic organs. Remember: every patient requires a complete primary and secondary survey, even when the injuries appear insignificant. When in doubt, evacuation is always a wise decision.

Understanding how we breathe is important in determining how to treat patients with thoracic injuries. Most of our backcountry treatments will include positive pressure ventilations (with pocket mask or Bag-Valve-Mask), and oxygen, if available.

It is essential to ensure that air enters the lungs where it is supposed to, through the trachea. These simple, timely, interventions can make a life-threatening situation one which can be managed until the patient reaches definitive care.

EDITOR'S NOTE: All of the invasive procedures described in this article are serious procedures which should not be attempted without proper training. This article is written to provide information on what can be done in the field. For proper wilderness medical training, the Wilderness Medicine Newsletter encourages you to consult your physician medical advisor.

CARDIAC RISK ASSESSMENT & ADVENTURE PROGRAMS

By Dr. Frank Hubbell

Adventure programs are considered "adventurous", at least in part, because they may require a fair amount of unusual physical or emotional responses. Activities in adventure programs are often exciting, potentially producing fear and anxiety while demanding a higher level of physical exertion. Obviously some adventure opportunities are more anxiety provoking than others— high elements on ropes courses, climbing or rappelling, white water rafting, and kayaking. Part of the learning and team building process is discovering how to harness this anxious emotional energy and make it work for you, not against you.

Adventure programs are available to anyone. However, not everyone is physically or emotionally capable of performing well in these situations and, as a result, may be putting themselves at risk of having an acute cardiac event, such as a potentially lethal heart attack. But is there a relatively simple way to predict who is at risk of an acute cardiac event? Being able to identify a high risk participant would allow an adventure group to modify the program for that individual thus minimizing the risk of a heart attack during the course. Obviously, in the opinion of this author, the answer to the question is "yes," there are predictors that can be used to identify individuals who have significant cardiac risk factors and would therefore be at increased risk.

Heart disease is a very common medical condition in this country. The term "heart disease" includes hypertension, coronary artery disease, angina pectoris, congestive heart failure, and a history of a myocardial infarction. Heart disease is the number one cause of death in the US, but quite often remains undiagnosed until an acute event such as a myocardial infarction (heart attack) occurs unexpectedly.

The heart is a muscle. Like any muscle, it requires constant blood flow from itself to itself to maintain a supply of oxygen and nutrients and to carry away waste products. The heart responds to demands placed on the rest of the body. During periods of physical exertion, it will increase the cardiac output, or blood flow, to meet the increased oxygen demand of the muscle groups being used.

The heart can also be stressed to increase cardiac output by certain hormones produced by the body. One of these hormones is adrenalin, also known as epinephrine. Adrenalin, produced and stored by the adrenal gland that sits on top of the kidneys, is the hormone used for fight or flight responses. When the brain perceives a dangerous or frightening situation, the adrenal glands secrete adrenalin into the blood stream. Adrenalin provides the burst of added strength and speed that may be needed to escape or survive the situation. As part of this process, adrenalin also increases heart rate and the strength of contractions of the heart muscle to dramatically increase cardiac output and supply more blood and oxygen to the muscle groups utilized in that particular situation.

As mentioned in the beginning of this article, adventure sports participants may find themselves not only in a physically demanding activity but also in one that is frightening or anxiety-provoking. As a result, their hearts, driven by the adrenalin secreted in response to the fear factor and the demands of the muscles for increased oxygen-rich blood, must work twice as hard . Individuals with underlying heart disease may suddenly find that this demand is too great for their diseased hearts and suffer an acute cardiac event in the form of a myocardial infarction or heart attack.

The problem for the adventure programs is how to identify those individuals with an underlying heart disease that could become a problem under times of extreme cardiac stress from the combination of physical exertion and fear. Obviously, it would be virtually impossible to identify every individual at risk. However, we can identify those with definite risk factors and, if needed, modify the program to minimize the cardiac stress and risk.

The currently identified risk factors include:

- has a known history of coronary artery disease, angina pectoris, or a previous myocardial infarction.
- has a history of hypertension.
- is currently taking medications for hypertension or cardiac disease.
- has diabetes, either insulin dependent (IDDM) or non-insulin dependent (NIDDM).
- has a history of elevated blood cholesterol or triglycerides.
- is a smoker.
- on the average consumes more than one alcoholic beverage per day.
- has a family history of heart disease.
- is overweight and does not have an exercise routine.
- has a history of chest pain with exertion.

These identifiers can and should be incorporated into a standard form that each individual completes before participating in an activity that is going to stress the heart. Some of these risks factors are better indicators than others and alone should suggest that the individual needs to be in a modified program.

The first and most obvious questions are historical. Does this person have a known history of coronary artery disease?

Do they have angina pectoris? Have they had a previous myocardial infarction? Have they had open heart surgery or a coronary artery bypass? Do they have hypertension? Have they ever had a stroke? Are they currently taking any cardiac medications? If so, these individuals need to either be in a modified program with less stress, or they need to present with a letter from a cardiologist stating that their heart would tolerate the stress.

Individuals who have chest pain with exertion, especially if associated with the chest pain is shortness of breath and sweating, also need to be evaluated by a cardiologist because these constellation of symptoms are very strong indicators of underlying coronary artery disease.

The other risk factors alone indicate that the person has potential risk for heart disease but do not indicate if the person currently has heart disease. But several of the factors combined are strong indicators that the person most likely does have underlying heart disease and should be questioned more closely or should participate in a modified program.

Individuals with diabetes have an increased risk of heart disease over non-diabetics as do individuals with elevated blood cholesterol or triglycerides, smokers, people who consume alcohol, overweight individuals without an exercise routine, and people with a strong family history of heart disease.

The following is an example of a CARDIAC RISK ASSESSMENT form.

I. Previous Cardiac History:

Do you have a history of any heart disease?	yes/no
Have you ever had a heart attack or a stroke?	yes/no
Have you ever had open heart surgery?	yes/no
Do you have hypertension?	yes/no
Do you take any cardiac medications?	yes/no
Do you have chest pains with physical exertion?	yes/no
Have you ever had a stroke?	yes/no

II. Cardiac Risk Factors:

Do you have diabetes, NIDDM or IDDM?	yes/no
Do you have elevated blood cholesterol or triglycerides?	yes/no
Do you smoke?	yes/no
Do you consume more than one alcoholic beverage per day?	yes/no
Do you have a family history of heart disease?	yes/no
Do you have a daily exercise routine?	yes/no

If any of the part I questions are answered "yes," then they need to either participate in a modified program or they need to have a letter from a cardiologist stating that their heart will tolerate the stresses of the program.

If three or more of the risk factors in part II are positive, then the participant should be questioned in more depth as to any current signs or symptoms of heart disease, such as chest pain or shortness of breath with exertion, and should be given the recommendation to participate in a modified program. Most importantly, if an individual who has been identified as having risk factors of potential heart disease suddenly develops chest pain or shortness of breath while participating in the program, they should immediately be treated as if they were having a myocardial infarction.

As stated earlier, it is impossible to identify every individual who might possibly have an acute cardiac event while participating in an adventure program. However, it is very possible to identity those at significant risk and offer them modified programs to minimize that risk. In addition, it is most prudent to suggest they pursue further evaluation by a cardiologist.

A corollary to the recognition of cardiac risk factors is the provision of rapid care in the case of a cardiac event. All adventure program trainers should have first aid and CPR training appropriate to the level of activity and distance from definitive care. And there are organizations available that can provide specific training in cardiac risk assessment for adventure programs.

MEDICINE CHEST MANAGEMENT OF ACUTE ANAPHYLACTIC REACTIONS

By Frank Hubbell, DO

Allergies are very common and, most of the time, cause only the minor discomforts of a runny nose, itchy eyes, or a scratchy throat which are easily controlled with a variety of over-the-counter antihistamines. The most extreme form of an allergic reaction is a systemic or body wide life-threatening reaction know as anaphylaxis.

All allergic reactions are initiated and driven by the release of a biochemical called histamine which is produced and stored in MAST cells. When these cells recognize an invader or foreign compound in our system, they alert other cells responsible for finding and destroying the invader by using the histamine. When these MAST cells overreact, the signs and symptoms of an allergic reaction become apparent.

As mentioned above, these reactions range from mild and benign to life-threatening. An allergic reaction or the over-production of histamine is treated by using antihistamines. However, when an anaphylactic reaction occurs, massive quantities of histamine are released from the MAST cells precipitating several life-threatening reactions that will require more than a simple antihistamine to correct.

Histamine causes blood vessels to dilate (vasodilation) and the airways in the lungs to constrict (bronchoconstriction). The massive vasodilation of the peripheral circulation in the skin causes red, raised welts know as hives or urticaria. The

histamine in these hives causes them to itch severely. The vasodilation can be so massive that is will cause shock from the peripheral pooling of blood in the extremities. Concurrent with the peripheral vasodilation, the airways in the lungs are constricting making it harder and harder to breathe.

An individual experiencing an acute anaphylactic reaction will present with shortness of breath, difficulty breathing, wheezing, anxiety, a sensation that they are going to die, and red, itchy hives. This reaction can occur very quickly (within minutes) after the exposure to the allergen or can be delayed for up to 24 hours. However, once it occurs, it is unmistakable.

Treatment consists of the use of a drug called EPINEPHRINE (adrenalin) and antihistamines. Epinephrine cannot be give orally; it can only be given as an injection. The epinephrine reverses the life-threatening vasodilation and bronchoconstriction by constricting the blood vessels in the periphery and dilating the airways. Epinephrine, however, does not treat the overabundance of histamine. So, once the epinephrine has taken effect, the patient must be given an antihistamine.

To make immediate care possible, two types of emergency treatments are available by prescription. The first, and perhaps preferred, is the ANAKIT which contains both a syringe with two doses of epinephrine and four antihistamine tablets. The other is the EPIPEN which holds a single dose of epinephrine.

As soon as an anaphylactic reaction is recognized— the person is losing their airway and unable to breathe— you would do the following with the ANAKIT:

- Evacuate the air from the prefilled syringe and give the person the first dose (0.3cc) of the epinephrine in the upper arm deltoid muscle. (The kit contains the exact directions on how to do this. Be familiar with these directions before a crisis occurs.)

- Once the person is able to breathe and swallow, give them all four of the antihistamine tablets. They are chewables making them easier to swallow and to be absorbed more quickly out of the stomach.

With the EPIPEN, you simply press the tip against the skin. Although this works just as well as the syringe, the ANAKIT provides the second, critical step in the treatment, the antihistamines. If you are carrying the EPIPEN, you must also carry an antihistamine such as benadryl or chlorpheniramine. Also, remember: the epinephrine only buys you time to get the patient to definitive care, lasting for 20 - 30 minutes. As it wears off, if the antihistamine is not absorbed out of the stomach, there may be a second anaphylactic reaction. If this occurs, a second injection of the epinephrine is needed. The ANAKIT provides a second dose in the prefilled syringe. You will need to pack a second EPIPEN, however.

If you are away from immediate help, then <u>you</u> are the definitive care. The epinephrine injection must be followed by the antihistamine or there may not be enough time to get the patient out.

Once the anaphylactic reaction is under control and the patient is able to breathe, evacuate them to the nearest medical facility for follow-up.

WHO'S WHO IN WILDERNESS MEDICINE: FRANKLIN R. HUBBELL, DO

By Buck Tilton

A long time ago, after the last dinosaur had died but when the smell from its rotting carcass still lingered in the humid air, back in the early 80's, I was an Outward Bound instructor in Florida dragged kicking and screaming to take a wilderness medicine course. My wild med instructor was Frank Hubbell, an enthusiastic and charismatic teacher if ever there was one. To make a long story as palatably short as possible, I was hooked and have worked, thanks to the start Frank offered me, in wilderness medicine ever since. I don't know how many people Frank Hubbell has had the same effect on, but I'll bet it's not a paltry number, and I'll bet the final tally would be higher than anybody else's in the growing community of wilderness medicine.

Back then Frank was an active care provider, a man voted the most valuable EMT in the State of New Hampshire, a care provider who had earned the highest achievement award given by the American Red Cross, a visionary who had seen the need for wilderness medical training in the 70's and who had founded SOLO, Stonehearth Open Learning Opportunities, and taught the first course there in 1976. Since then, he graduated with top awards from the University of New England's College of Osteopathic Medicine, and now, in addition to directing SOLO, practices family medicine in Fryeburg, Maine. Dr. Hubbell continues to be a starter, a generator, a catalyst, a big bulky bearded man with a spirit to match his body.

Dr. Hubbell has contributed profoundly to the healthy spread of wilderness medical knowledge through his creation of SOLO, his many years of teaching, his presentations at conferences far too numerous to mention, his authorship of the chapter on "Wilderness Emergency Medical Services and Response Systems" in the third edition of the definitive *Wilderness Medicine*, and his co-authorship of *Medicine for the Backcountry*, second edition, undoubtedly the most popular how-to book for wilderness medical providers ever published.

WMN: Dr. Hubbell, what do you consider your most significant contribution to wilderness medicine?

Dr. Hubbell: I believe my most significant contribution has been the establishment, with my wife Lee Frizzell, of the only wilderness medical training center in the world, Stonehearth Open Learning Opportunities (SOLO). There has been nothing like it, there is nothing like it, and I believe our efforts here have done as much or more than anything else to build validity

for wilderness medicine. And certainly, SOLO has trained more students than any other wilderness medical organization.

WMN: What do you consider a major problem for outdoor programs and wilderness-oriented organizations and what guidelines do you offer?

Dr. Hubbell: The greatest need among outdoor leaders and enthusiasts is the ability to think through a problem and make a reasonable decision. At SOLO we make every effort to teach students to look at a problem from all angles: how serious is the injury, how far away is help, how able is the group to deal with the problem, what can be done now, what can be done later, what is the best plan of action. No two people are exactly the same, no two problems exactly the same, no two treatments exactly the same. We oppose training that calls for regurgitation of memorized treatment. We stand for training that encourages thoughtful evaluation and action in the best interest of the most people. Our brains are our greatest medical tools.

WMN: Are you willing to have our readers write to you with their questions?

Dr. Hubbell: Yes, of course. Write to me at SOLO, PO Box 3150, Conway, New Hampshire 03818.

NEW WILDERNESS GROUP FORMED

The National Association of Emergency Medical Technicians Board of Governors voted to form a specialty society within NAEMT for wilderness and disaster medicine. The decision was revealed at their annual educational conference. The focus of the society will be prehospital care beyond the "Golden Hour of Transport." For those who are unfamiliar, the National Association of Emergency Medical Technicians is a professional organization for prehospital care providers. The acting chairperson will be Wilderness Liaison David Tauber, NREMT-P. Dues are $5.00 for NAEMT members. For further information contact NAEMT at 1-800-34-NAEMT or write NAEMT, 102 West Leake Street, Clinton, Missouri 39056.

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PO Box 3150, Conway, New Hampshire 03818
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Feb. 15-22 WEA Fall Creek, TN (970-223-2231)
Feb. 19 - Mar. 1 - NOC, NC (704-488-6737)
March 11-22 - Saxonburg, PA (412-352-9220)
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Mar. 2-3 - SUNY, NY (607-777-2233)
Mar. 9-10 - Bucks City BSA, PA (215-345-1400)
Mar. 9-10 - Alexandria, VA (708-836-8905)
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Mar. 30 - April 7 - Pitkin, CO (970-641-3572)
Apr. 5-14 - Univ. of Montana, Missoula, MT
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Apr. 16-25 - San Juan Island, WA (970-641-3572)

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Feb. 24-25 - Crestone, CO
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Mar. 9-10 - UCSC, Santa Cruz, CA (408-459-2806)
Mar. 30-31 - Marin Headlands, CA

Wilderness EMT Refresher
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Wilderness/Rural EMT Module
April 18-23 - Pitkin, CO (970-641-3572)
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